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Degree: Master of Science

Year of this Degree Granted: 2001

University of Alberta

Preference Construction for Passive Use Values in NW Saskatchewan

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A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment
of the requirements for the degree of Master of Science

In

Agricultural and Resource Economics

Department of Rural Economy

Edmonton, Alberta

Fall, 2001

University of Alberta

Faculty of Graduate Studies and Research

The undersigned certify that they have read, and recommended to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled *Preference Construction for Passive Use Values in NW Saskatchewan* submitted by Bradford Shapansky in partial fulfillment of the requirements for the degree of Master of Science in Agricultural and Resource Economics.

Abstract

Canada has a vast amount of forested public land. Presently, public environmental concerns related to how and where forestry operations are ongoing is paramount and driving research for improved and sustainable methods. The economic framework is one method to address this issue and consider the different values and benefits derived from the forest. Traditional economics assumes individuals have well formed and stable preferences. When applied to the nebulous non-timber passive use values associated with forestry, this assumption is inadequate. This study considers the non-timber passive use values in NW Saskatchewan through a public involvement process and preference construction technique. Preference construction is examined using split sample techniques. Three separate small groups were used to determine if improved performance and increased consistency in survey results may stem from a greater period of preference construction.

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1.0 Introduction

The preponderance of forestland in Canada, about 94 % (National Forest Strategy, 1998), is public land and therefore public input into resource management is prudent and mandatory in a democratic polity (CSA, 1996; FSC, 1996; ISO 14001, 1996). In an attempt to address public concern, policymakers have initiated a myriad of social and scientific research agendas to bolster the policy armamentarium and affect a positive change in the direction of sustainability. However, more efficient and sophisticated management of the landbase is required in order to pursue sustainability, meet multiple objectives, and achieve welfare maximization desired by the variegated interest groups. The economic framework is one approach available to deal with these issues.

1.1 Economic Considerations

Economic consideration of natural resource allocation involves how choices are made while facing scarcity (de facto tradeoffs) and uncertainty. The objective is to maximize societal welfare through an optimal allocation of resources. However, in order to arrive at a social optimum, *all the society's values* must be known in order to manage Crown Land in society's interest. In making policy decisions about resource allocation to maximize welfare, it is important to understand the role of preferences, and the benefits and costs to landscape planning alternatives. Economic theory assumes that preferences are well-defined, stable, and in fact, are a necessary prerequisite to measurement and maximization of social welfare (Freeman, 1993). Some of these values (for tangible goods and services) are easily discernable as they move through a market exchange where a price is determined via market forces (i.e. supply and demand equilibrium). Conversely, many other values circumvent the market and are not expressed with a price. Hence, these values are called non-market values (NMVs).

1.2 Non-Market Values

In economics a price is tantamount to the marginal value one holds for something and the aggregation of individual willingness to pay constitutes its economic value to society. Since non-market goods and services do not have a price they have traditionally been marginalized, undervalued or completely ignored (McFarlane and Boxall, 1998). Recent economic treatment of such values begins with efforts to achieve a common metric (e.g. dollars). Economic theory has, however, progressed and gained credence to the point where these types of values may be delineated, conceptualized, and estimated through the aid of hypothetical markets. Fait accompli, NMVs may then be commensurate with other private market goods or competing claims.

1.3 Non-Market Valuation and Study Objectives

The NMVs of interest in this thesis involve concern for the environment or natural resources. In order to estimate these environmental non-market values a hypothetical market must be established which presents a realistic milieu for making choices (Freeman, 1993). One category of non-market values is known as passive-use (or non-use) values. In economic terms, passive-use values (PUVs) are the monetary values that individuals hold for natural resources that are independent of their present use of those resources (Freeman, 1993). These environmental public goods have PUVs that are often nebulous, complex, and ill-considered by most people in contrast to private goods which are frequently considered.

The average person is unfamiliar with their values for novel goods and services. An extension of this idea reaches into the realm of individual values for environmental qualities and quantities (Bowles, 1998). This estranged relationship with these environmental PUVs provides some difficulty in their elicitation. Two difficulties arise: are the preferences present to be elicited and what is the best way to elicit the preferences if/when they are present? Attempting to elicit these complex, non-market, PUVs from the uninitiated often results in unstable preferences (Mitchell and Carson, 1989; Schkade and Payne, 1993). If the elicitation of erroneous responses from individuals occurs (due to preference formation instability or volatility), then estimation of individual value will be flawed or biased and policy prescriptions misguided.

In order to overcome this barrier a process for consideration of these inchoate PUVs may greatly benefit their formation, elicitation, and eventual estimation. The process whereby values are formed through a concerted effort such as group discussion, information provisions, and enough time to cogitate, is known as preference construction (Gregory, 2000). Thus, a hypothesis maintained and considered throughout this thesis is that a preference construction exercise realized antecedent to survey elicitation may result in an improved method of preference elicitation.

Eliciting public preferences via a hypothetical market relies on some form of public involvement. Public involvement is any means by which the public is involved in a decision (CSA, 1996). This thesis examines a technique for eliciting more stable and well-defined preferences through an iterative construction exercise involving the public. One may envisage public involvement as a continuum of involvement based on the intensity, degree of contact, and information exchanged between two or more parties (e.g. the public and an agency). Ultimately, the objectives of this research are to: 1) ascertain the PUVs for a given landbase (refer to Case Study section 2.3.6), 2) explore the differences in preference formation based on the degree of formal preference construction preceding an elicitation exercise (i.e. a survey as a market proxy), and 3) evaluate different methods of public involvement.

In this study, preference construction is examined using split sample techniques. Three separate groups were formed and invited to take part in different aspects of preference formation exercises before completing a survey. The specific hypothesis tested here is that the more intense and comprehensive the preference construction exercise, the more stable and well-formed the preferences in the responses procured by the survey. In light of these considerations a superior technique of public involvement and preference formation may be available through deliberative process coupled with a survey. Further, those individuals not participating in pre-elicitation preference formation exercises are more likely to manifest survey protest [1] or increased variance in their responses.

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[1] Many different forms of survey protest are possible e.g. failing to complete the survey or choosing only the status quo response.

This research allows the impacts of changes in the environmental attributes to be translated into economic values and the benefits to society derived from different management scenarios. This information may ultimately be used to assist forest managers in managing the forest to maximize social values while maintaining the ecological integrity of the landbase. In order to manage and allocate land to the myriad of competing interests, a fairly comprehensive set of values for the whole suite of activities and interests must be ascertained. Many people value the existence of a standing forest for such qualities as ecosystem services, wildlife habitat, and biodiversity, which are examples of *passive-use non-timber values.* This research is applied to issues in the NorSask Forest in northwestern Saskatchewan in an attempt to construct and elicit well-formed and stable preferences from the public in a public involvement process.

1.4 Thesis Organization

The remainder of the thesis is organized as follows: In Chapter 2 the background theory, review of the literature pertaining to environmental valuation and preference construction and the study area are described. In Chapter 3 a method for preference construction and the survey design is considered. Chapter 4 considers model specification. Chapter 5 holds the results and some discussions while the final chapter will draw some conclusions and portend some future directions.

2.0 Theoretical Background and Literature Review

2.1 Valuation of Natural Resources

Public concern for the environment has foist upon resource owners and managers the need to value a myriad of outputs derived from the forestland. Outputs range from marketplace goods such as timber and minerals, to non-market goods and services such as scenic views, wildlife habitat, old growth forests, and ecosystem services. These non-market features of a landscape are valued by society and therefore should be determined and included in social decisions in order to maximize economic welfare. Policy changes have many ramifications and in order to achieve the goal of *economic efficiency* (i.e. a balance between marginal benefits and marginal costs), *all* the costs and benefits (whether market priced or not) to *all* affected, must ideally be considered. The value assigned to the individual voice in a democracy (ostensibly espousing non-paternalism or individual sovereignty) requires that a means of measuring or expressing individual welfare and preferences be available. Both status quo neoclassical notions of sovereignty and individual preferences will be confronted later in this chapter. Hitherto, non-market values have rarely been *explicitly measured* and incorporated into landscape planning.

2.1.1 Non-Market Values

Non-market values are associated with goods and services that are not traded in the marketplace and thus do not have an explicit price. Valuation processes have been designed to derive monetary measures for environmental changes not manifested in the marketplace. Since non-market goods and services are becoming increasingly important; valuation has been applied in four major areas: 1) assessment of environmental damages/ compensation associated with an anthropogenic incident; 2) natural resource accounting of natural capital in pursuit of sustainability; 3) project evaluation/ CBA[2]/ land-use planning; and, 4) full cost pricing to incorporate negative externalities. When considering industrial forestry both land-use planning and full cost pricing applications may be relevant.

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[2] CBA = Cost Benefit Analysis.

The forests of Canada have public good characteristics and the public (e.g. recreationists, aboriginal groups, and urban dwellers) value them for a number of "outputs" that are not traded in markets. The most difficult of these characteristics involves passive-use, which involves a number of elements. One of these is called existence values. These values are associated with the *existence* of some good or service that is not necessarily linked to any consumption. Another category called bequest values involves values in bequeathing (or endowing) a given resource to future generations. A final example is spiritual values, which may be associated with areas of traditional, historical or cultural significance. All of these values are devoid of marketplace exchanges and generally not traceable via market transactions.

Market goods normally transmit valuable information through prices and demand quantities, and can be used to indicate contributions to individual welfare. A crucial distinction must be made between the more complex passive-use values of public or quasi-public goods in contrast to private goods usually referred to in the market setting. Public goods often result in market failure and under-provision (misallocation) if left to the private sector to supply.[3] Public goods have non-rivalrous (one person's use or consumption does not reduce another's) and non-excludible (where the right to exclude others does not exist or is impractical) characteristics (Field and Olewiler, 1995). It is more helpful to consider public goods on a continuum where different degrees of non-rivalry and non-exclusivity apply.

A forest may be conceptually divided into timber values (TV's) and non-timber values (NTV's). Timber values are simply derived from the wood products sent to market and sold at a given price and quantity. The NTV's, by convention, may be further divided into *use* values and *passive-use* values. These intangible passive-use values may be both longstanding (e.g. spiritual) and incipient (e.g. existence values) due to changes in society's information, knowledge, and understanding of nature. Passive-use values and their preference elicitation are a core consideration of this thesis.

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[3] The government may also under-supply public goods but in the case of environmental public goods they are being reduced and the supply can only decrease for some of these values (e.g. clean air and water – start pristine and are fouled only to be cleaned up or improved after some point).

2.1.2 Economic Valuation of Non-Timber Benefits

There are direct and indirect means to determine NTV's. Indirect means, or 'revealed preference' (RP) techniques, rely on observed behavior and thus measure non-timber use values that leave a behavioral trail.[4] Examples of RP techniques are the travel cost method and the hedonic price method.[5] The direct methods, or 'stated preference' (SP) techniques, rely on surveys to elicit willingness to pay (WTP) for or willingness to accept (WTA) in compensation to forgo a non-market good or service simulated through a hypothetical situation. Passive-use values are devoid of a behavioral trail and thus are limited to estimation via direct methods or the information people voluntarily relinquish in SP techniques such as the contingent valuation method (CVM) (Carson et al., 1994). The value given is contingent on there being a market created and described using interviews or a questionnaire (Adamowicz, 1991). This type of valuation is very flexible and is only dependent on the plausibility of the market scenario – this allows the valuation to go beyond known experience (recent information) and products (available data) in order to forecast demand.

2.1.3 Contingent Valuation

The CVM is the dominant direct method for valuing non-market goods and services. The value of the non-market good is 'contingent' on there being a market (albeit hypothetical) for that good or service. A hypothetical market is constructed through a survey designed to make the scenario as realistic as possible. CVM is based on individual utility maximization. Individuals are considered to have preferences that may be represented by a utility function. All experiences and aspects of life enter into that individual's utility function - *including* natural resources and passive-use values. If natural resources are altered in quantity or quality it is logical that individual utility and value will change. This unobservable value change is equal to the economic passive-use value or equal to the individual's willingness to pay for an environmental good, even though s/he may never intend to make any active use of it (Adamowicz et al., 1998).

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[4] An example would be a hunting or recreational trip.
[5] Indirect methods are not the focus here and are only mentioned for completeness.

The referendum CVM ties choice to a vote which determines an individual WTP by focusing on *one* issue and asking only one or two questions (i.e. comparing a base case with a changed case to determine the welfare associated with the resource change). This method of valuation has been shown to be robust and yet is frequently maligned (Arrow et al., 1993; Harvard Law Review, 1992). The main criticisms are important and have lead to improved CVM design and concomitantly spawned new non-market valuation techniques. The criticisms have been aimed at the fact that CVM is hypothetical and thus cannot be externally validated (Desvousges, 1995). It is prudent to be cognizant of these problems, as any survey-based research will perennially grapple with these issues.[6]

A potential for problems with the CVM arises from sources of "bias". There are many such sources[7] but two important ones are strategic behavior and embedding effects. Strategic behavior is the phenomenon of mis-stated preferences (over or under stating one's true WTP) in an attempt to benefit[8] or alter policy in ones favor. The *embedding effect* consists of sequencing and scope, which relate to the size of the environmental good or service being offered. Fragments of a good are often valued equally to the complete set and thus the size of a good to start with then becomes crucial (adding up effect). The purchase of *"moral satisfaction", "yea-saying" or "warm glow"* are possible with the nature of the public good and the desire to be helpful or do good things (Kahnemann and Knetsch, 1992). Alternative descriptions and explanations of the good (i.e. context or framing effects), albeit subtle, may affect measures of value. An indubitable disparity arises depending on whether *losses or gains* are emphasized (Tversky and Kahnemann, 1981). The role of *information provision* used to make decisions and alter preferences is discussed later in relation to preference formation. The hypothetical market must be made as realistic as possible to obviate these effects and others relating to the hypothetical nature of the survey (Mitchell and Carson, 1989). If the hypothetical bias in a survey is not transcended then inaccurate information (false

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[6] Unless a society has referenda on these topics.
[7] These sources of bias are only listed for completeness, but are beyond the scope of this paper. The biases are known as sampling bias (true population cross section), starting point bias (where to start the bidding), vehicle bias (payment mechanism and possible protests), hypothetical bias (plausibility of payment), and information bias (information accuracy and amount may alter the WTP)

payments) results (Randall and Hoehn, 1983). This host of critiques has lead to innovations in both technique and survey design. One promising new technique (refinement) within CVM is the attribute based stated choice method (ABSCM) or simply referred to as a choice experiment (CE) (Boxall et al., 1996; Louviere et al., 2000).

2.1.4 Choice Experiments

The advent of CE's to environmental economics has been recent but they have been employed in marketing, transportation and psychology research for a longer period of time (Louviere, 1988; Adamowicz et al., 1994). CE's ask individuals to choose from alternative bundles or cases described by attributes. As with CVM, CE's gather utility information, and ultimately value, directly from consumers. The attributes are variables that describe and define the differences between the alternatives or specific scenarios. The levels are the values of the attributes. The researcher designs a CE with a factorial design (or a fractional factorial design to limit the number of choices required) and to ensure orthogonality (i.e. design without collinearity[9] or reduced collinearity) between attributes. CE's are also compatible with random utility theory[10] and therefore able to elicit passive-use values.

There are distinct advantages to using CE's to measure passive-use values vis a vis referendum CVM. First, CE's provide a more comprehensive description and realistic melieu for individuals to consider attribute trade-offs. This trade-off quality to the survey makes strategic behavior more difficult and 'yea-saying' less likely as it is more difficult to isolate the "good cause" (Hanley, 1998). Having the CE based on attributes allows not only the valuation of situational changes but the attributes as well thereby directly addressing the embedding effects of CVM (Adamowicz, 1994). Resource managers and policy makers desire this information to assist in planning. Further, CE's may provide useful information in environmental damage cases by suggesting the optimal 'in-kind' goods necessary for compensation (Mazzotta et al.,

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[8] Free ridership is an issue when it comes to the provision of public goods. If an individual feels a good will be provided by others then they may understate their true WTP.
[9] Collinearity is the problem of having different attributes move in the same direction (increase or decrease together) and this makes the estimation of the individual attributes difficult.
[10] A complete discussion of the random utility model (RUM) occurs in the following chapter.

1994). In contrast to the single scenario focus of CVM, CE's attempt to understand and interpret the preferences of respondents over the attributes of the scenario rather than a specific scenario (Adamowicz et al., 1998b).[11]

2.2 Public Involvement and Forest Management

To recapitulate, Canada is a democratic society and the forests of Canada are publicly owned which mandates a public voice in the way forested lands will be managed. Public involvement has the potential to share the decision-making with local people and other stakeholders[12] and thereby come to a better, more efficient, less costly, and lasting, publicly accepted, decision (CSA, 1996). Considering the plurality of the modern world, it would seem unlikely that any group or corporation would hold all the information required to come to a sustainable solution. In order to find the creative solutions demanded, a diversity of knowledge and expertise is required.

Public involvement (PI) is increasing with respect to many public and environmental projects due to dissatisfaction with previous government or agency guardianship (Rippe and Schaber, 1999). The agencies that oversee the environment are often plagued by the following institutional issues[13]: overlapping jurisdictions, multiple constituencies, low public confidence and trust, weak agency commitment (e.g. poor staff morale, low budget), unknown affected groups, technical complexity (poor communication between professionals), lack of staff experience, and decision bias (e.g. from the political orientation or lobbying) (Iacofano, 1990). These foreboding perceptions of the agencies may create a greater impetus for public involvement beyond the legally required amounts. Even further, the assumed consequences and benefits on a *personal and societal level* are: enhanced self-esteem and control over one's life and environment (personally empowering), development of personal values and an increase in ability to relate to the larger society, reduced social alienation and the building of

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[11] There are some drawbacks to using CE's to elicit preferences. The survey design required to procure these benefits is arduous and often involves extensive refinements. Adamowicz et al. have shown benefits to doing combined CV and CEs in some surveys (CE surveys are sometimes cognitively onerous and complicated which may result in a status quo bias).

[12] A share in the decision making process may be less likely but they opportunity to inform the process to the publics' values.

[13] Listed only for completeness but the development of these are well beyond the scope of this work.

community, and lastly development of a political efficacy in individuals resulting in a more democratic and healthier society (Iacofano, 1990).

Other possible reasons for PI may be that the citizenry is more educated, better informed, and wealthier. The affluence increases the likelihood of a society being post-materialist and able to afford the required time to understand issues related to quality of life (Morley, 1990). It may even be a backlash against the forces of globalization (e.g. tremendous public demonstrations protesting at the WTO and IMF[14] meetings around the world during 2000 - 2001) may leave people feeling in a state of anomie.

2.2.1 Institutional Benefits to Public Involvement in Decisions

The benefits to PI are manifold:

1) Technically better and more informed decisions (balance input);
2) Improved transfer of skills and information (informed public);
3) Provide cost-effective options;
4) Help address and mitigate project impacts;
5) Decrease the likelihood of project delays (i.e. conflicts, blockades, or protests) litigation (i.e. more legally defensible decisions) and clear definition of rights, responsibilities, and role of all parties;
6) Improve project management within the organization;
7) Help identify issues, concerns, and public priorities (including a strong consideration for future generations);
8) And finally, mediate between competing interests and thus less controversy and broader public acceptance (CSA, 1996).

Ultimately, this process has those interested individuals share in the decision, which then holds them partly responsible for the final results and therefore should diffuse blame (i.e. democratizing risk management) and adversarial polarization (McDaniels, Gregory, and Fields, 1999).[15] Moreover, there is a stark difference between the values of

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[14] WTO = World Trade Organization and IMF = International Monetary Fund – both organizations widely seen by some NGO's as promoting the western economic and development agenda globally which is leading to environmental degradation and human rights abuses.
[15] Some individuals may refuse to participate or compromise in any fashion; this type of individual may be motivated by a single agenda, a personal vendetta, or generating conflict itself. This process (or any other)

professional foresters and the public. Forestry professionals tend to be less supportive of some environmental values and forest management goals, perceive everyday forestry operations as less risky, be more trusting of science and governments, and more accepting of forestry activities than the general public which reveals potential sources for conflict and miscommunication (Wagner et al.,1998). Thus, a PI process acts as a direct link with the economic goals to elicit the public preferences arising from the resource – these preferences may in turn be fed back into the management decisions. The PI process and the SP survey (i.e. CE here) dovetail well in the goal of maximizing social benefits and economic efficiency.

Proper public involvement should foster trust, goodwill, public empowerment, and provide a vehicle for avoiding disputes.[16] These efforts to engage the public and seek balanced solutions are more likely to secure the fiber source for the operators. One caveat, the aphorism cautioning 'how slowly trust is built and how quickly it is destroyed', behooves all land managers (Slovic, 1997).

2.2.2 Participation and Trust

The public participation in a PI process may depend on many personal and social motivations and likewise achieve multiple personal or social ends (Van den Doel and Van Velthoven, 1993). Consequently, the derivatives from a PI process may be either, or both, values (eliciting preferences) and empowerment (process related ends) on many different levels. In order to seek either of these broad goals via PI the process must be sincere and genuine.

A successful PI process is founded on mutual trust between the parties. The requisite trust between the different parties is engendered through honest and good faith dialogue whereby the public process may still make a difference in outcomes. If the PI is an ersatz process, this will only fortify the duplicity and leave the public further adrift and distrustful. In this scenario, PI is contraindicated for it exists solely as an illusion of full or partial participation; when in reality the decision or policy has already been made and

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will fail to satisfy this malcontent personality type and researchers need to be careful not to have this type of individual scuttle the whole process.
[16] Mistik has established Co-Management Boards that meet regularly to address local issues related to forestry.

the desire is to make the participants feel useful. Decision makers may even feign genuine interest to appease irate citizen groups (Iacofano, 1990). Occasionally this strategy works, as the *process (methods or means)* of consultation is sometimes all that matters, rather than *the outcome (objective or ends)*. Ultimately, a sage public will become impatient, cynical, and resort to more confrontational tactics if their effort and goodwill is abused. In this research, a sincere attempt was made to develop trust through delivering on all commitments and offering an egalitarian, flexible and open process. We also agreed to deliver the 'results' to all participants following the process.

Arnstein's ladder (Figure 2.1) is a classic portrayal of the levels of involvement and is instructive for all managers considering PI (Arnstein, 1969). A threshold level of six or greater is considered meaningful PI but venturing beyond level six presents other problems in management and decision-making.[17] An awareness of the continuum and the trade-offs within the different approaches are important to appreciate.

Level of Participation	Hierarchy
Degree of Citizen Power	8 Citizen control
	7 Delegated power
Degree of Tokenism	6 Partnership
	5 Placation
	4 Consultations
	3 Informing
Non-participation	2 Therapy
	1 Manipulation

Figure 2.1 Arnstein's Ladder of citizen participation (Arnstein, 1969).

Well-conducted PI harnesses a tremendous amount of knowledge and insight by the ultimate judge of ones actions – the public. Public approval is essential to private businesses operating on public land, which is subject to market forces (e.g. certification

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[17] Issues on consensus and time limitations are some of the difficulties with full participation and citizen control. Additionally, given a representative democracy and the complexity of issues, it is likely wiser to have the role of policy set by a legitimate and accountable government institutions empowered to make public choices versus an ad hoc public gathering.

of forest products) and governmental change (i.e. regulations). PI is well-suited to preference formation and elicitation through stimulating dialogue. For example, referenda, elections, or major purchases all tend to stimulate discussion, public learning, and preference formation. Several kinds of public participation inform this research: direct democracy and citizen panels come public involvement workshops (PIWs) are used to form such preferences.

2.2.3 Forms of Public Participation

There are different classifications for PI according to method and epistemologies[18] (O' Connor, 2000). The two that are most relevant to this research are the ideas of direct democracy and citizen panels. Direct democracy (with its referenda and initiatives) is a means to limit power of the political parties and well-organized interest groups (i.e. the public may circumvent political unwillingness to react), promote deliberation of political topics amongst citizenry that may shift preferences, and finally, legitimize decisions. The problem associated with direct democracy is that it assumes well-informed voters and actions in the public interest. This may not include defensible actions with respect to intergenerational equity (Rippe and Schaber, 1999).

Citizen panels (or juries) are groups of randomly selected citizens gathered to participate in a discussion to identify the values and concerns of those affected by a decision. The sequence of a citizen panel is: introduction to an issue, give background knowledge through lectures, introduce conflicting interpretations of information, introduce different options, problem-structuring, introduce a value-tree, evaluation of options through discussion, and drafting rough recommendations. It is important that the participants are randomly selected and not representatives of socially organized interest groups. It should not be a mediation exercise between interest groups trying to negotiate an agreement or compromise. The panel should be free to discuss and change the concerns and interests they had before they joined the process rather than articulate and defend immutable constituency positions. Empirical results show that citizen panels are places where the change of preferences takes place (Rippe and Schaber, 1999).

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[18] Listed for completeness: 1) Cartesian – CVM 2) Democratic – citizen juries which are deliberative and 3) Complexity which rests on multi-criteria (linguistic), institutional (conflict) analysis and in-depth interviews (discourse analysis).

Citizen panels are not invested with any power but rather are used to advise public officials. The advent of citizen panels has a produced two problems: One is the amount of time it requires for the individuals and thus this is best reserved for exceptional and controversial public policy issues, and the other is that some people consider the whole procedure to be a game. This hypothetical nature raises the specter of strategic behavior. However, it is argued that if these panels had real power they might lose their independence and simply become another local parliament consisting of representatives subject to the usual lobbyism. Some feel these panels will work as long as they are not institutionalized. Others suggest their success will lead them to be institutionalized either de facto or de jure and lose their beneficial aspects. (Rippe and Schaber, 1999).

2.3 Preference Formation

Preference formation over environmental goods is a complex and exceedingly important issue with consequences to present and future generations. In an effort to model and predict human behavior more accurately, it is essential to better understand the decision-making processes of individuals and to glean wisdom from other relevant disciplines of study. Many academic fields have concerned themselves with the understanding of human behavior.[19] Traditionally, economists have taken many aspects of human behavior and decision making as "given" or exogenous by assumption, which could be misleading in modeling economic behavior.[20] Therefore, in order to understand and model human behavior better, a more comprehensive and interdisciplinary research agenda must be pursued. The crux of this section is to consider preference formation and choice selection over a range of environmental attributes, both qualitatively and quantitatively, presented in either CVM or CE's.

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[19] Areas such as psychology, social psychology, sociology, political science, anthropology and education etc. have all sought to understand and model human behavior. This topic is colossal and beyond the scope of this paper.

[20] Human agents in past economic modeling have often been considered rational and homogenous for simplification. This deterministic view of human nature is probably more accurate in pure biology and less in the social sciences. Cultural vagaries and technology may alter human behavior profoundly and make the process more dynamic.

2.3.1 Revisiting the Assumption of Preference Stability

Market goods or private goods are often less complex and individual preferences may indeed be well-formed in this area. Conversely, the economic simplification that individuals hold well-defined, stable, and exogenous preferences that are known to them has been undermined by copious research (Bowles, 1998; Norton et al., 1998). In the short run preferences may be somewhat stable, but in the long run,[21] preferences are clearly endogenous and subject to change. It is now recognized that (beyond genetic evolution, education, and technological change) markets and other economic institutions[22] influence the evolution of values, tastes, and personalities (Bowles, 1998). It is incumbent on economists to embrace this evidence now for without endogenizing preferences, economic inquiry is truncated and restricted in its explanatory power, policy relevance, and ethical coherence (Bowles, 1998).

Consumer sovereignty in conventional economics is based on the assumption that tastes and preferences are "given". Thus the economic problem merely consists of optimizing those preferences (Silberberg, 1978). This sovereignty assumption stresses the dangers in evaluation and criticism of individual preferences. The fear among some economists is that any evaluation of preferences may cascade toward paternalism, expertism, and perhaps even totalitarianism (Randall, 1988). This suggests that, if preferences change, they should do so only by highly individual and non-coercive means. This however denies the reality that preferences are manipulated by outside forces on a daily basis (i.e. pervasive advertising).

While retaining democratic principles and procedures, some researchers wonder if it is possible to bring scientific, rational, and moral arguments to bear on the question of whether some preferences are more defensible than others (Norton et al., 1998). In considering externalities, for example, full cost pricing or changes in taxation decrease utility and yet if preferences are changed antecedently, the implications for individual utility are positive. If the goals of society are chosen through a process that includes public input and a free exchange of information, then a challenge to some post-industrial

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[21] The use of short-run and long-run have the usual economic interpretations.
[22] For example, rules of allocation influence human development, affecting personality, habits, tastes, identities, and values.

preferences is not antithetical to democratic principles (Norton et al., 1998).[23] This process invites an iterative and full participatory democracy to define and articulate broad and intergenerationally equitable social goals and in fact operationalizes democracy.

In making policy decisions about resource allocation aided by CE's that maximize welfare, it is important to understand the role of preferences in either CBA or landscape planning.[24] In economic theory it is assumed that preferences are well-defined and stable - this is a necessary prerequisite to measurement of welfare (Freeman, 1993). Without knowing what people want, there is no 'optimal'. These economic assumptions[25] about individual preferences are of paramount importance to the researcher concerned with the economic value of public goods (e.g. the environment). If the elicitation of erroneous individual responses occurs due to preference formation instability or volatility, then welfare measurements will be flawed or biased and policy prescriptions misguided. Present policy based on ephemeral preferences may have irreversible or long-term impacts (for decades, centuries or even longer). Thus some economists are calling for criteria beyond Pareto efficiency[26] if sustainability is a purported goal (Norton et al., 1998).

In considering complex non-market goods and services (e.g. passive-use values), psychologists and many economists are concerned that preferences for relatively unfamiliar natural resources[27] are not well-defined and may instead become symbols of general environmental concern (Mitchell and Carson, 1989; Schkade and Payne, 1993). Preferences often evolve as a judgement or choice task progresses and respondents have adequate time to cogitate and consider the trade-offs with which they are confronted.

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[23] Norton et al. query if a certain degree of paternalism may be an important tool for developing and implementing sustainable institutions and policies. Indeed smoking is a case in point. Attitudes toward smoking have changed but only after a concerted and ongoing effort by government to alter preferences. This was partly achieved by restricting the tobacco industry manipulation through advertising and unabashedly targeting children. If full-blown consumerism were believed to have high social costs then by analogy discouraging these preferences would also be a responsible use of society resources.

[24] A distinction between preferences and constraints is important but it becomes merely semantic when constraints become internalized and de facto utility is increased when adhered to. Constraints may be considered a socially beneficial norm formed to solve certain problems and thus able to change over time or co-evolve with the culture.

[25] Other assumptions are that preferences are complete, monotonic (or non-satiation), and transitive.

[26] Pareto efficiency or optimality is an equilibrium where it is impossible to make any person better off without making someone else worse off (Field and Olewiler, 1995).

[27] Environmental goods are often complex, unfamiliar, and richly multidimensional, involving a wide range of scientific, aesthetic, life-support, ecological, religious, recreational, and economic values.

CE's (multi-attribute and multi-response SP methods) are well suited to capturing these dynamic and cross-sectional effects and hence provide more meaningful measures of WTP versus CVM (Johnson et al., 1999). For this reason, CE's may be able to untangle some of the initial "noise" and vicissitudes in preferences (Coupey et al., 1998). Other economists feel that preferences *are* well-defined but may be insensitive to small changes in the level of resource (Mathews et al., 1995). Still others allege preferences to be well-defined, but concede that individuals have considerable difficulty with (or have a moral objection to) translating their preferences into monetary terms (Gregory et al., 1995).

An important requirement in NMV is the existence of substitutability between goods (Freeman, 1993; Adamowicz et al., 1998). The lack of available substitutes between goods may dramatically affect WTP/WTAC measures (Hanneman, 1991). The existence of taboo and revered objects, or groups of goods that are hermetically isolated from other goods or environmental goods, such as endangered species or unique scenic views, may preclude substitution. The appropriate means[28] and level of information provision in CE's is an important and emerging area of interest and is generating interdisciplinary research agendas (Kenyon and Edwards-Jones, 1998).

2.3.2 Fostering Stable Preferences Prior to Survey Completion

Human beings are fallible processors of information and optimizers under choice situations. Information requires deliberation and there are costs to deliberation as cognition is a scarce resource and the effort spent is usually directly related to the importance of the decision. This phenomenon of using cognition sparingly is known as bounded rationality (Conlisk, 1996). Under bounded rationality, individual decision-making is constrained by income, time, imperfect memory, and calculating capacities. In fact, novel tradeoff scenarios usually manifest bounded rationality. Therefore, nascent preferences may be elicited during the CVM (or other preference elicitation methods); individuals often form preferences to ill-considered values only when asked, and not beforehand. Thus, when considering choice tasks, individuals are often aided by a variety of methods (heuristics or simplifying cognitive strategies), which do not uncover well-formed preferences (Tversky et al., 1988; Johnson et al., 1997).

The method(s) used by individuals to complete choice tasks is contingent upon the problem (task and context), person (knowledge, ability, and goals), and social context (accountability and group membership) factors that impact both the cognitive and the emotional state of decisions (Payne et al., 1997). Consequently, preferences formed during the measurement process may diverge from preferences formed spontaneously without exposure to measurement. A classic case familiar to scientific research - the Heisenberg principle - admonishes the very act of measuring something may in fact be changing it. However, if a forum to debate issues was available to respondents prior to completing a survey, a more accurate and stable set of preferences may emerge (Gregory et al., 1995).

Some argue that CVM may produce improved results with greater information provision and adequate time in which to think and reflect on meaningful topics (i.e. a valuation stage prior to preference elicitation). The potential exists for information error due to time constraints and the complexity of the issue. A valuation error may also result despite the information being understood, due to limited time (Whittington et al., 1992). An important caveat applicable here is to recall that information alone is not necessarily enough to generate stable preferences. The information must be understood, believed and internalized in order to have an impact on choices. This internalization (or generalized reasons for motivation) requires time, exposure & repetition (Bowles, 1998).

2.3.3 Theory of Preference Construction

Informing legislation through the use of discursive and deliberative approaches in the formation of public values is burgeoning (Fishkin, 1995). The focus is on group learning, discourse, and consensus building. This highlights the synthesis (and synergy) of combining economic theory with political science in that deliberation and consensus formation are distinct from the aggregation of individual WTP, in seeking the appropriate path to evaluation of public goods in a democracy.[29] Ultimately, when applied to direct valuation, groups are formed and provided with "adequate and appropriate information," then encouraged to engage in discussion and deliberation to determine their WTP for a

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[28] There is a plethora of techniques used to convey information describing an environmental scenario: Audio and visual aids such as videos, photographic, textual and ecological data.
[29] This may link to the employment of referenda and direct democracy.

public policy choice. The precise methods required for fostering citizen preferences and to determine what society should do are unknown but different criteria are emerging. An important distinction is between consumer preferences, which reflect conceptions of the good life individuals seek for themselves; and citizen preferences, which reflect conceptions of the good society, offered for the consideration and agreement of others (Sagoff, 1998). Individual views may be expressed and are encouraged but should be couched in terms of what 'society should do' and evaluated on merit. The debate should proceed without reference to personal well-being.

The advantages of a preference construction approach are numerous: 1) It offers an opportunity for social learning, to participate in a social process, and construct a collective judgement as citizens about the value of a public environmental good 2) The deliberative approach allows the respondents to clarify among themselves explicitly what they are valuing and why and thus avoids the ambiguity in survey questions 3) It provides access to relevant information to avoid the missing values 4) Asks for responses to parts of the problem to reduce the risk of cognitive overload 5) It uses natural metrics to avoid protestations and 6) assists respondents in combining the parts into a single whole for overall assessment.

2.3.4 A Model of Preference Construction

Heeding the notion that preferences are constructed, it is expected that they are highly sensitive to features of the task and context that influence the process of construction (i.e. preference formation for non-market goods is endogenous to the survey) (Schkade and Payne, 1993; Hanemann, 1994).

This multi-attribute approach is aimed to elicit thoughtful, informed judgements from a small number of key participants[30] who are gathered to discuss an issue in depth via an intensive workshop or a 'public value forum' (Keeney et al., 1990). It relies on the *depth* of respondents' understanding to replace the breadth of population sampling. The individuals involved are from specific groups important to the decision-maker to gain

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[30] Numbers may range from around 20 to 50 or more depending on time, budget constraints, importance and complexity of issue. The proper identification of stakeholders is imperative to the valuation process and omissions will result in an incomplete range of values.

insight into their views regarding the relevant objectives and trade-offs (McDaniels and Roessler, 1998).

Ideally, the group does not negotiate, but rather the discussion provides a forum for participants to learn from discourse, reflecting iteration and different framings of the same question in order to make more informed value judgements about the uncertainites and explicit trade-offs. The workshop process initially begins with information provision and the amount and type of information is known to affect judgements (Fischhoff et al., 1980).[31] The group should be probed to ask questions and air their views so that learning and discourse is promoted. Questions should be rephrased with comparisons and consistency checks in order to refine thinking on the topic (McDaniels and Roessler, 1998).

A series of five steps can be used to operationalize the method and guide participants through the valuation process. First, structuring the problem – i.e., why the problem is relevant to the participants. This stage of problem representation relies on mental models, analogy, and the decision frame. Thus, failures may occur due to inappropriate analogies, embedding effects and depending on how a question is framed. Second, measuring the objectives using attribute measures that stakeholders can understand and relate to. Information search and interpretation – this information may be from both personal and group memory and external sources. The processing limitations of humans mandate selectivity and thus information is often encoded to a reference value. This phase confronts problems of context effects and arbitrary reference points to name a few. Third, information combination refers to the required tradeoffs to consider (make trade-offs across objectives). Pitfalls to preference construction may occur due to avoiding tradeoffs, or range and quantity insensitivity. Fourth, compare alternatives and the expression of preferences (the mapping from value to response). Individuals lacking relevant preference maps construct them on the spot (Fischhoff and Furby, 1988). Even if established values exist, if they do not transfer well from memory to the response scale an error may occur from incompatibility. A finally, fifth, assess sensitivities and in some instances search for group consensus (Payne et al., 1997; Gregory et al., 1998).

Consensus was not sought in this research as individual utility remained central to survey completion, although social well-being was prominent in group discussions.

The potential advantages of multi-attribute elicitation in a group setting are numerous: First, it may reduce the cognitive burden on participants by breaking down the process into stages. Second, it may provide informational benefits by allowing subjects to ask questions, interact with the elicitor, and hear the comments and views of others (i.e. augment limited individual rationality with the collective wisdom of their social group) (Conlisk, 1996). Third, enhanced legitimacy that comes from asking questions that directly reflect the actual policy trade-offs (e.g. increased passive-use-values in lieu of forestry jobs and revenues) rather than individual WTP as experienced in CVM, which may be viewed as irrelevant or inappropriate for many environmental goods (i.e. citizen preferences versus individual preferences). Fourth, lower rates of refusal or 'protest' values. And finally, lower research costs with comparable results to full-blown CVM (McDaniels and Roessler, 1998).

2.3.5 Model Applied

A more discursive, information-rich, and deliberative process was employed in this study, which sought to enable respondents to construct well-informed and considered preferences and values in relation to five archetypal environmental attributes. The participants were instructed to consider issues relating to landscape passive-use values and the implications for present and future generations. In general, circumstances that promote stable preferences and values are more likely to occur when the issues considered are familiar, simple, and have been directly experienced. Beyond familiar experiences, individuals given the opportunity to think and reflect in an informed and more critical way on their "pre-existing preferences" may develop stable preferences based on "full" information. This framework was adapted and employed to the study area in a quest to understand the passive-use values and issues in the NorSask Forest region. Gradations of public involvement were used in this research to test the notion of preference stability and/or survey protest.

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[31] This is a difficult area to determine what information is relevant and credible and aiding in the process versus irrelevant and potentially inflammatory. GIS information may useful in passive-use values in describing an area.

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2.3.6 Case Study – The NorSask Forest

Saskatchewan is a prairie province made up of approximately 54% forest. The NorSask Forest is part of the boreal forest of northernwestern Saskatchewan. The boreal forest is a dynamic and frequently disturbed (especially by fire) forest (Johnson et al., 1995). Hence, the boreal forest does not attain the 'stasis' or long-term climax conditions known in the temperate rainforest of the west coast of North America. In contrast to the cathedral temperate rainforest (many hundreds of years old), the boreal forest of Canada is often disturbed before it grows beyond a few decades.[32] The boreal tree species are different, fewer, smaller, and younger than their temperate rainforest counterparts (Messier and Kneeshaw, 1999). Despite these differences, the boreal forest has supported many local subsistence activities (e.g. hunting, fishing, trapping, and gathering) for generations. More recently, boreal tree species have been recruited as a fiber source for industrial forestry expansion. Additionally, the boreal forest had been recognized as very important to global ecosystem function and the research agenda has burgeoned. The Kyoto protocol[33] has brought a considerable interest to the carbon balance, and the boreal forest is now seen as a major carbon source and/or sink (Apps et al. 1995,1998). Hence, the relevance of this type of research and landscape usage has both microcosmic (local) and macrocosmic (global) implications.

The town of Meadow Lake in the province of Saskatchewan (Figure 2.2) is the epicenter for the forestry operations (timber management and location of both the sawmill and pulpmill) of the NorSask Forest Management License Agreement (FMLA). The NorSask Forest is entirely on Crown land as are most of the resource extraction industries in the province. The ownership of the Saskatchewan forest (and most natural resources in the province) is 97% Provincial Crown Land and 2% Federal Crown Land (Saskatchewan Forest Facts, 1998).[34] Thus, the public interest in the management of these resources seems clear. Denial of this reality may result in conflict, as was the case

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[32] Fire suppression and logging in lieu of fire has changed the forest dynamic. Historical fire regimes and the range of variability is still controversial.

[33] Kyoto Protocol is the provisional agreement on climate change and carbon dioxide reductions in developed countries that was drafted in Kyoto, Japan, in 1997.

[34] The other 1% is Private Forest Land.

in the expansion of the Saskatchewan forest industry in 1992 when environmental and aboriginal groups established a blockade on a major access highway north of Meadow Lake (Beckley and Korber, 1996).

The demographic make-up of NW Saskatchewan varies while moving from the more southern part (i.e. Meadow lake) of the region to the more northern. In general, Meadow Lake is similar to the provincial averages, while the north is very different as Table 2.1 indicates. A comparison of four different communities (Meadow Lake, Green Lake, Beauval, and La Loche) moving in the northern direction form Meadow Lake shows the trend. The northern populations have more aboriginal peoples, a higher rate of population growth, a younger population, less education, higher unemployment and lower income compared to the rest of the province. This age-class structure and impending population momentum has present and future policy implication for the province.

Table 2.1 Demographic characteristics for Saskatchewan and the NW region of the province.

Characteristic	Sask.	Meadow Lake	Green Lake	Beauval	La Loche
Aboriginal population (%)	11.2	33.3	94.2	93.6	93.8
Population change (%)*	0.1	11.5	4.5	9.5	16.3
Average age of population	35.7	31.7	29.0	24.4	21.1
% Population > 15 yr. of age	76.9	71.8	65.7	59.2	55.2
% Population (> 25 yr.) with < grade 9 education	15.4	17.4	37.0	25.7	56.2
1996 unemployment rate	7.2	11.1	22.2	15.1	32.2
Average income	22,541	22,536	13,827	16,555	11,367

* Census data for time period of 1991 to 1996.

Mistik Management, located in Meadow Lake, is a not-for-profit company that was formed in 1990 and is responsible for planning, harvesting, and reforesting the NorSask FMLA. The two parent companies are NorSask Forest Products Inc. (owners of the Sawmill and interested in softwood – mostly Spruce and Pine) and Millar Western Pulp Ltd. (owners of the Pulpmill and interested in the hardwoods – Aspen) (Beckley and Korber, 1996). This third company, Mistik Management, was designed to meet the timber demands of both Meadow Lake mills. This innovative approach allows the tenure area to be managed for two separate mills and with opposite fiber demands. Hitherto, in

most locations across Canada, overlapping tenures result in greater conflict between competing timber resource users and greater fiber wastage due to separate companies with different incentives and interests working simultaneously on the landbase (Cumming and Armstrong, 1999).

The Saskatchewan government stipulated in the agreement that both fiber and non-fiber values must be considered in the FMLA. In order to manage the FMLA in a holistic manner consistent with ecosystem management and sustainability, the extant values must be known and regularly re-estimated in order to capture the vagaries inherent in human values (while remaining faithful to the ecological science).

Figure 2.2 The NorSask Forest (shaded area) and the town of Meadow Lake in Saskatchewan.

Meadow Lake ⟶
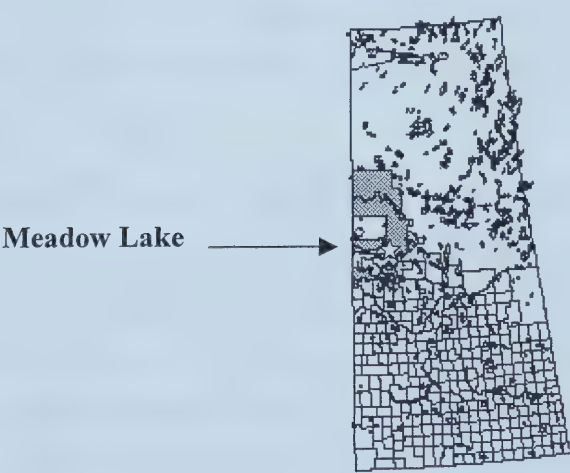
3.0 Methods

3.1 Survey Development

In order to test the hypothesis that different degrees of focused cogitation preceding a choice task might lead to different outcomes or variance in group choices – three separate small groups were deliberately formed. Two focus groups or workshop size gatherings of between twelve and twenty people were formed and one larger group of forty individuals were mailed the CE survey. Each group had a different experience and involvement with the survey, different exposure to information, and access to the researchers before completing their choices. Group 1 (GP 1) participated in three separate Public Involvement Workshops (PIWs) spaced approximately one month apart. This group was involved in designing the survey with the researchers. Group 2 (GP 2) participated in a single workshop (or PIW) and a final group, Group 3 (GP 3), received the final survey in the mail.

3.2 Sampling Frame, Recruitment, and Data Collection

The sampling method was non-probabilistic (i.e. non-random sampling). The sampling or population frame included anyone living within approximately a two-hour radius defined by driving time from Meadow Lake, the location of the PIWs. This was a practical limitation as the PIWs were held on weekday evenings (7-9 PM) to maximize attendance. Inclusion criteria were: anyone interested and willing to commit the required time[35] to the process and living within the designated region – no education or special training/knowledge was required. As a corollary, the exclusion criteria were: any person currently employed by or under contract to Mistik Management or unable to commit the requisite time. The sampling methods employed were: Quota sampling (efforts to balance gender, age, income, occupation, level of education, spatial area or region, and aboriginal vs. non-aboriginal individuals were undertaken) and snowball sampling or chain referral (e.g. Town Office personnel helped with identifying potential participants).

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[35] Different groups had various degrees of time commitment (three meetings, a single meeting, or mail survey alone).

Recruitment strategies consisted of many different approaches ranging from electronic postings (email recruitment letter), telephone contact, and direct curbside recruitment, group and organization appeals for interested members, and incentives (mileage re-imbursement[36] - 30 cents per kilometer, hosting refreshments and snacks, strict confidentiality throughout the process, and a gift book[37]). Retention strategies included serial telephone conversations between workshops to remind participants of meetings and elicit other input. Mileage claim forms were distributed following each meeting to defray out-of-town participants travel costs and to add credibility to the research.

3.2.1 Recruitment Techniques

Initially, a general email message describing the nature of the research and the level of commitment required was disseminated to many different groups and organizations within the province of Saskatchewan[38]. It was requested that the names of interested individuals either be forwarded to the researchers or that interested parties contact the researchers directly. This method was fruitful and did bear some participants.

Many small towns in the specified two-hour radius of Meadow Lake were visited and a research notice and explanation was delivered to the town clerk at the town/village office (Appendix B). A follow-up telephone call was placed a few days to a week later and names of potentially interested individuals were furnished at that time.[39] These individuals were contacted directly in order to address any questions or concerns while concomitantly trying to 'sell' the value of the research and gain a 'verbal contract' for participation. If interested and able to participate then arrangements were made for an

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[36] Mileage claims were available for those individuals driving greater than fifteen minutes one-way. This was less an incentive and more an effort to defray personal costs in attending.

[37] The members of the first PIW, which required three workshops to be attended, all received a book (either the 'Trees in Canada' or 'Birds of Canada' were selected as the options to promote further interest and education in related issues; the second and third group members, one meeting and a mail survey respectively, were entered in a draw for a book.

[38] Groups were found through the Directory of Canadian Associations under Saskatchewan. The Meadow Lake Parks and Recreation list of Service clubs, Adult and Youth Organizations, and Native Organizations was consulted. The relevant groups were contacted (some were phone contacted and others had webpages) and members from the region of interest sought.

[39] Some individuals were consulted by the town clerk prior to having their name forwarded to the researchers while in other cases the names were simply given and the first contact was made via the researcher.

information package to be mailed. This method was very successful in using local individuals' knowledge and expertise in recruitment. Moreover, the individuals in the town offices were invariably cooperative, helpful and kind.

The local (North Battleford and District) phonebook was used to contact certain towns, groups, and individuals regarding their potential participation in the research. Those town/village offices not visited in person were contacted by telephone and the same recruitment protocol described above was followed.

3.2.2 The Public Involvement Workshop Forum

The PIWs themselves were held in the meeting room of a local church. The tables were arranged in a rectangular-circle fashion allowing eye contact and neutral positioning for all participants. A recording device was used throughout the process and captured the discourse and comments of the participants for more accurate transcription. Three different FMLA maps[40] were displayed for the participants to refer to throughout the workshops.

3.2.3 Group 1

The first group was invited to three separate PIWs in Meadow Lake, Saskatchewan during the fall of 1999 and winter 2000. Each meeting was roughly two hours in length and spaced approximately one month apart (October, November 99, and January 2000). The first group achieved a core number of 17 individuals, who participated in all aspects of the research.[41] All individuals were pre-mailed a Pre-PIW Attitude and Beliefs (AB) survey (Appendix B) in order to assess the recruited group (GP 1) in relation to other groups (independent of this research) based on results from similar surveys (Robinson et al, 1996; McFarlane and Boxall, 1999). Additionally, this would ideally begin a preference constructing experience. These surveys were collected in the first session and results presented in the following PIW. A Forestry Familiarity Assessment (Appendix B) was also completed in the first session to determine the degree

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[40] Maps included a base map with harvested blocks and future harvesting areas, age-class distribution/inventory, and a the final map was all the different tenure areas throughout Saskatchewan.
[41] Some individuals attended all PIWs but did not contribute to any of the survey aspects.

of awareness and information the group possessed in terms of the local forestry operations. It may further educate and motivate some members of the group.

The goal with the first group was to develop and pre-test a survey instrument in a group forum in order to stimulate discourse and mutual learning. The objective was to develop a level of comfort and trust amongst the participants and between the researchers and the group in order to glean the breadth and depth of a smaller number of individuals versus a large random sample restricted to written comments via survey results alone.

3.2.3.1 The first meeting of GP 1

During the first half of the meeting, everyone in attendance introduced him/herself and gave some background as to why they were interested in this research. A representative from Mistik management made a brief appearance and sanctioned the research and the value of the process and results to the company. Following the introductions, an overview of the research goals were presented and discussed. Then the Forestry Familiarity Assessment (FFA)[42] questionnaire was distributed and completed. The answers to the FFA were provided immediately following their collection. A presentation and explanation of CE's and how they are used was then delivered to conclude the first half of the workshop.

During the second half of the meeting the group was divided into three roughly equal-sized groups and a crude/preliminary attribute list or choice task was discussed. This preliminary choice task listed some attributes of the NorSask Forest as a possible foundation for a survey and solicited the group to add attributes they felt were missing. The list initially offered a handful of attributes (eight) previously recognized from other research efforts, published literature, and known to local industry as important through other PI sources (including co-management boards). The first workshop focused on conceptualizing and adding missing attributes to the list (see Table 3.1 below). The workshop closed by summarizing each groups modified lists by having one member from each group read them aloud to the plenary group.

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[42] A True/False/Uncertain questionnaire used to assess the background knowledge of the group(s).

Table 3.1 Initial attribute list and group additions

Suggested attributes of the NorSask Forest	Attributes or concerns of GP 1
Ecological Benchmark	→ Efficiency of harvest, technology, park area, timber shortages (rather selective logging), soil degradation, and drought in cover removed, watershed management (water quality), harvesting to manage fires and before it decays.
Forest Age class (% Old)	
Woodland Caribou	
Moose	
Forest Access	→ Recreation, conservation, wildlife habitat and fishing & hunting, jobs, water quality, regeneration, understory plants - berries and medicinal plants, soil erosion, pace of change, global warming and climate change, genetically altered tress.
Recreation Restrictions	
Provincial Household Taxes	
Direct Forest Industry Jobs	→ Relation between taxes and forestry and jobs, risk of being wrong – AAC, trust issues between industry, government and public, future generation.

From this exercise a more refined and complete list of attributes was settled upon and efforts to further delineate and clarify these attributes were initiated. Before disbanding the group, some reading material[43] was made available and workshop individuals were invited to submit any relevant questions with respect to the research, forestry and/or Mistik's operations. [44]

3.2.3.2 The second meeting of GP 1

Seventeen individuals returned to the second PIW and this formed the core group committed to the entire process. The opportunity of the second PIW was used to present the bulk of the information in reference to forestry research, current theory on ecosystem management and operations. This information was composed of answers to questions submitted in the first meeting (requested answers) and an extension of these queries to consider present forest management in the NorSask forest.

The presentation began by displaying their (GP 1) questionnaire results (see Chapter 5) from the Pre-PIW AB survey collected in the first PIW. These results were

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[43] An article discussing scientific uncertainty and limitations and a book entitled the NorSask Forest Story.

compared to the results from the Canadian Forest Survey (Robinson et al., 1996). The Canadian Forest Survey sampled three different groups: local (Forest Dependent Communities or FDCs), provincial, and national populations to determine what the differences are in opinions and beliefs related to forests and forestry operations. This Pre-PIW survey was a valuable tool in this research for it allowed comparisons between different groups (our three different groups to other Canadian FDCs, and amongst our own groups). Additionally, it afforded the participants with practice in filling-out surveys (warm-up task) and even possibly provided motivation to understand their feelings towards the forest and forest management. In comparing our GP 1 to other randomly sampled FDC's, we found the results very similar, which satisfied us that we had a reasonably representative group.

The presentation next answered the questions submitted by the participants at the end of the previous workshop.[45] Other information presented was based on comments and concerns written in the Pre-PIW surveys (i.e. soft queries; not formally submitted as questions to be answered but embedded in survey comments) and attributes individuals deemed as very important.

Other information presented concerned general forest management principles and in particular, Mistik's approach – in essence it was a presentation (and discussion) of state-of-the-art forestry. Furthermore, a slide show[46] of forestry operations (both aerial and ground photographs) compared and contrasted past practices with present day techniques. The slides demonstrated the efforts being made to alter the forest with cut blocks more akin to natural disturbance (i.e. "feathered" edges and partial overstory removal, and work within historic natural disturbance boundaries), new techniques to limit road networks and minimize soil compaction, road reclamation and decommissioning, site preparation, herbivory research (exclusions), adaptive management[47], and ecosystem management. This presentation also included information

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[44] Questions were anonymously submitted to be researched and answered in the following session.
[45] The nature of the questions had to do with AAC, regeneration, and levels of harvesting. This was not surprising as the number one perceived threat identified in the Pre-PIW survey was pertaining to the number of trees being cut in present day logging.
[46] This slide show consisted of approximately 60 slides of recent photographs (taken in summer 1999) on the Mistik FMLA.
[47] Adaptive management is based on the idea that scientific knowledge is provisional, and that management is approached as a learning process or continuous experiment. Finally, it connotes a flexibility and

on water quality issues, fish habitat, soil compaction, and site or ecosystem integrity as paramount to good stewardship and management.

There was no attempt to suggest that Mistik's practices were, or were not, state-of-the-art.[48] Although discussions with Mistik before the presentation and information provided by the company was in complete agreement with current theory and they expressed a will to use present information and to contribute to that knowledge base via adaptive management (i.e. monitoring forest disturbances and committed to learning). The information was delivered to the group as neutral and unbiased as possible and no conclusions were draw by the researchers.

In concluding the first half of the meeting, each participant was given a rating and ranking exercise to complete. The exercise dealt with eight different attributes concerning the forest. In order to keep the CE from becoming too cumbersome and complex it was important to keep the number of attributes manageable based on importance. It was important to convey and understand that when considering landscape level changes many attributes may be subsumed in other larger attributes. For example, a large protected area may also ensure wildlife habitat, water quality, old growth forest, and limit access. This exercise allowed for a further refinement of the CE (see Chapter 4). The participants were all sent a copy of the Alberta Forest Conservation Strategy (AFCS)[49] to read and consider some of the larger issues related to forest management.

3.2.3.3 The third meeting of GP 1

The final workshop followed a similar format to the previous meetings and relayed results regarding the attribute rating and ranking exercise completed in the second session. This exercise allowed certain attributes to be coalesced (i.e. access and recreation restrictions were combined) in the next iteration of the survey. Answers to submitted questions[50] were considered and discussed. The second half of the PIW

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adaptation to new knowledge. This is encouraging but smacks of hubris in that it does not address the scale issue or time lag revelations. How big of an experiment is prudent? How much time is required to acknowledge errors and change practices?

[48] The initiative to use more local and small contractors has resulted in some gaps between planning and execution on the ground.

[49] The AFCS was a paper available through the Alberta Government for discussion purposes.

[50] Questions were dealing largely with issues of harvesting schedules, forest inventory, and business inquiries concerning export markets and profits.

consisted of the participants completing the latest draft of the survey followed by a discussion of the instrument. The debriefing discussion centered on impressions of the survey and concerns or strategies employed when making choices.

3.2.3.4 Following the third meeting of GP 1

The survey was subsequently altered by adding some correlation between a few of the attributes that posed the greatest confusion (i.e. unrealistic combinations according to the glossary discussion of the attributes and there purported interactions) or protest in the respondents (Chapter 4). Due to this late stage amendment, the final iteration of the NorSask Forest Survey was then mailed to all members of GP 1 to be completed and returned. This iteration of the survey was received by the participants as an improvement and remained as the final version applied to the other subsequent two groups (GP 2 and GP 3).

3.2.4 Group 2

The second group was contacted by telephone and invited to a single PIW in Meadow Lake, Saskatchewan on the 18 th of April 2000. The meeting was roughly two hours in length and attracted 12 individuals[51] sampled and recruited in a similar manner as those in GP 1. All individuals were pre-mailed a Pre-PIW AB survey. These surveys were collected and discussed in the first part of the meeting. The FFA was completed and answers provided. A description of the research objectives and how CE's are used was presented. An open discussion followed concerning any issues related to forestry or the research.

In the second half of the PIW the NorSask Forest Survey designed with GP 1 was distributed, completed, and a de-briefing session was held. The discussion concentrated on the participant's impressions of the survey and what approaches were used in making choices and trade-offs. Finally, a book was drawn as a door prize and the meeting was brought to a close.

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[51] Twenty individuals were invited to attend this gathering.

3.2.5 Group 3

A final group of forty individuals[52] was contacted by telephone and mailed the NorSask Forest Survey (a composite survey derived from the previous Pre-PIW AB survey – abridged version and the complete CE section). This group of participants was then telephone contacted after two weeks to remind them of the survey[53], confirm its arrival[54], and discuss any queries, confusion, or concerns. If the survey had already been completed and returned, the individual was debriefed (e.g. asked how they found the questions) and gratitude expressed for their contribution to this research. If the survey was lost or misplaced another copy was re-sent.

A summary of the different groups and their level of involvement with the survey and informational provisions are found in Table 3.2.

Table 3.2. Level of involvement and information provisions per group.

Group Number	GP 1	GP 2	GP 3
Complete Pre- PIW AB survey	Yes	Yes	Abridged version
Complete Forestry Familiarity Assessment (True/False)	Yes	Yes	No
Number of Group Meetings (PIWs attended)	3	1	None
Phone contact with researchers in between meetings	Yes	Yes, follow up call post meeting	N/A
Group discussion preceding Choice Experiment	Yes	Yes – limited	No
Reading material provided by researchers	Yes	No	No
Participants provided with an opportunity to ask relevant questions [55]	Yes – direct and submitted	Yes – limited direct questions only	No
Explanation of Choice Experiments – how they are developed, used, and the results available	Yes – on *two* separate occasions	Yes – on a *single* occasion	No
Survey completion method	Central Location	Central Location	Mail out

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[52] More than forty individuals were contacted but surveys were sent to the first forty individuals that were interested and willing to receive the survey.
[53] Those who had already completed and return mailed the survey were thanked and asked if they had any comments or concerns regarding the survey or the research.
[54] Those who failed to receive or misplaced the survey were re-mailed another copy and given more time.
[55] Questions entertained and answered had to do with any aspect of forestry in northwestern Saskatchewan including Mistik's operations, our research techniques and the development of the survey.

4.0 Experimental Design

Two different survey instruments were used to ascertain very different information from the PIW groups. The first survey was a general AB survey aimed at gathering general information in a more familiar survey format (i.e. rating scales). The second survey was the CE which challenged the respondents to value and trade-off different attributes in their choice selections. This split in the survey, along with the discussion afforded GP 1 and GP 2, allowed for a very wide net to be cast and absorb as many opinions and ideas as possible.

4.1 The Attitude and Beliefs Survey

In order to gauge, understand, and possibly segment the target population all the respondents completed the initial AB survey. This approach allowed additional information to be collected in an alternative format (rating questions, ranking tasks, open ended questions and additional comments). Further, this general survey acted as a warm-up exercise that established a baseline for some feelings or sentiments toward the forest. This information may ultimately be used to categorize individual worldviews as either biocentric or anthropocentric and further determine the linkages between attitudes, choices, and behavior. Our sample group results were consistent with other similar populations[56] and thus could be seen as representative of rural opinion and values (see Chapter 5).

4.1.1 Survey(s) Content – general question types

The AB Survey was divided into three sections. The first section contained some general worldview questions related to views on technology, the economy, and the human place in nature. The second section elicited opinions on forests and forest management in Saskatchewan. This section contained:

- A ranking exercise for different environmental priorities.
- An open-ended question on whether you believe present forest management is sustainable.

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[56] Forest Dependent Community.

- Rating statements[57] on what you perceive as a long-term threats.
- Rating statements on feelings toward the forest.
- Rating statements on forest management in Saskatchewan.
- Some specific questions related to forestry involving biodiversity, old growth forests, and partitioning the forest for specific activities (Triad questions).
- Ranking exercise in regards to public involvement and whose voice should be most important.
- Participation in what activities in the NorSask forest question (options included many use values – consumptive e.g. hunting/fishing and non-consumptive e.g. birdwatching).

The final section elicited demographic information (gender, age, memberships, resource dependent employment, education level, household income, and residence history). This section also provided an opportunity for additional comments including an invitation to attach further comments if space limited.

4.2 The Choice Experiment Development

In designing the Choice Experiment (CE), it was important to implement an acceptable protocol for designing the survey instrument. A series of steps were followed which allowed the attributes and levels to be identified and conceptualized in the CE. In general the steps included: a definition of the study objectives or problem, a qualitative study stage which delineated the most important issues (attributes and levels), the development (survey design) and pre-testing of the survey, define sample characteristics, data collection, model estimation, and finally policy analysis and implications of the results (Adamowicz et al., 1997).

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[57] All rating exercises used a Likert scale (rating scales typically are composed of a set of statements to which the respondent expresses a degree of agreement or disagreement. Five and seven-point Likert scales are common. In this case a five-point scale was used.).

4.2.1 Study Objectives

This fundamental stage defines the question or problem to be solved. In this case the study objectives relating to passive-use values have been outlined in the second chapter. This research was concerned with landscape level issues and how different mechanism of PI might affect preference formation and stability. Landscape level refers to changes on the landscape that are large (i.e. potentially affecting the whole FMLA), relatively long-term (twenty to thirty year planning horizon), and affect a larger and more diverse group of people, in contrast to the co-management board[58] issues dealing mostly with local harvest plans in the near future.

4.2.2 Qualitative Study

The qualitative stage involves many different sources of information to acquaint the researcher with the situation. As a starting point a review of the germane literature, focus group discussions, interviews with experts, and study area media are all good sources to help in understanding the issues and language of the discussions.

In this study, the relevant literature was consulted to determine the current issues related to landscape management, forestry, ecosystem management, public involvement, and economics. Environmental and landscape issues and concerns are very complex. They may emerge form local citizens, environmental or conservation groups, academia, or the media. The scale may be local or global. Thus, issues in this research had implications to both local and global environmental quality.

The town and area of Meadow Lake was visited to discuss what the issues and concerns were regarding land management. Relevant Mistik Management staff (e.g. district foresters, co-management board attendees) were consulted for emerging issues and concerns relating to the landbase. Additionally, a number of local Saskatchewan Environment and Resource Management (SERM) employees were visited to discuss land management issues and the research objectives. SERM officials also supplied some technical advice (e.g. current animal populations estimates). Finally, local print and television coverage was reviewed.

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[58] Co-management is employed in the study area. The co-management boards meet approximately once a month to discuss more immediate issues related to forestry in a given area.

Focus groups or workshops were designed and used to further understand the issues. The attributes for the CE were defined in this process and the levels were determined jointly via current scientific literature and local knowledge. The focus groups aided in the wording and language of the survey to ensure it would be amenable and understood by the target population.

4.2.3 Survey Design and Pre-testing

The final CE task consisted of a series of 16 SP choice sets (considering landscape level passive-use attribute scenarios) with one status quo option and two 'alternative futures' options to choose from. Each individual was instructed to assume all situations presented were plausible and to simply pick the option for each of the trinary choice sets most favorable to them (i.e. the one they liked best or disliked least). They were also reminded that each scenario should be viewed as being independent and unrelated to all other scenarios (before and after) in the instrument.

The workshops helped identify and refine the descriptions of the attributes and levels listed in Table 3.1. The set of attributes and levels were used to create choice sets using an (4^7) x (4^7) orthogonal main effects design[59], which produced 64 choice sets that were blocked into four versions of 16 choice sets each.

The CE was pre-tested and refined according to de-briefing comments and estimation results (some attribute coefficients were not statistically significant) offered by GP 1. Following a pre-test (Chapter 3) it was determined that some degree of correlation (approximately 10%) between protected areas, forestry sector employment (both direct and indirect jobs), and taxes was required to satisfy objections or confusion raised by some respondents. The counter-intuitive movements in some of the attribute levels, due to the orthogonal design, were perceived as unrealistic. The "protected area" was established by the design algorithm in each case, and from this, the number of jobs was determined by adding a small random number until there was a correlation of about 0.10. This larger (and only partly determined) range of jobs was now described as including

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[59] The main effects design refers to the main effect of each variable (i.e. the effect on the experimental response of going from one level of the variable to the next averaged over the remaining variables). There may be many different interactions between variables and these may not be ascertained by a limited design and are assumed to be negligible (i.e. fractional factorial design versus a full factorial experiment).

both direct and indirect jobs. The vagaries of employment were coming from the uncertain relationship between jobs and managed landbase (i.e. technological change and capital for labour substitutions, etc.). The relationship between jobs and taxes was also correlated to about 0.10. Each version was randomly ordered (i.e. unique to each respondent) for the 16 choice tasks to eliminate an order effect. Each respondent was then randomly assigned one version of the survey to complete.

The GP 1 PIW3 iteration of the survey offered seven attributes. Of these attributes, six had been *explicitly* discussed by the group in previous workshops (i.e. moose, special species, forest age class, recreation restrictions/access, household income tax change, and employment). The seventh attribute was *implicitly* discussed and was now offered as a 'forest management approach', which considered the 'Triad' approach to forest management. The three parts of the triad consist of intensive, extensive, and set aside areas of the landbase in differing proportions. The idea behind this type of landscape specialization is to avoid doing the same type of "experiment" everywhere. Some productive land areas may be managed more intensively for trees (to harvest the AAC) in order to diminish the impact on the extensive margin (everywhere else). The set aside areas would be de facto protected areas and may provide an ecological benchmark. This management attribute however, proved too complex and abstract for the majority of the group and was replaced in the final iteration with a simplified 'protected area' attribute (see Table 4.1 for final attributes and levels and figure 4.1 for example of choice task).

Table 4.1 Attributes used in the NorSask Forest stated preference experiment.

Attribute	Level
Moose	2,000; 6,000; **7500**; 14,000
Caribou	50; **300 to 500**; 600; 1,600
Forest Age (% Old)	Less than Current Amount; **Current Amount**; More than; Considerably more than
Recreation Restrictions & Forest Access	**Two-wheel drive (2WD) access**; 4WD required; ATV required; Foot Access only
Protected Areas	**Current Amount**; 5 %; 10 %; and 15 % Above Current Amount
Forestry Employment	Jobs ranged between 270 and 860 **(Current = 600)**
Provincial Household Income Tax Changes	**(Current = No Change)** Taxes ranged between a decrease of 120$ to an increase of 205$ year

Figure 4.1 An example of the choice task in the final version of the CE.

Attributes of NorSask Forest	Option 1 *Current situation*	Option 2 Alternative situation	Option 3 Alternative situation
Moose (ungulates)	7500 moose	2000 moose	14,000 moose
Special Species – Caribou	400 caribou	1600 caribou	1600 caribou
Forest Age Class (% Old)	Current Amount (% Old)	More than Current Amount (% Old)	Less than Current Amount (% Old)
Recreation Restrictions & Forest Access	2WD	Foot	2WD
Protected Areas (%)	Current Amount	15% Above Current Amount	Current Amount
Forestry Industry Jobs	600 Jobs	510 Jobs	560 Jobs
Provincial Household Income tax Change	No Change in household taxes/yr	$40 Decrease in household taxes/yr	$10 Decrease in household taxes/yr

Choose One Only: ☐ ☐ ☐

40

4.3 Analysis of the Choice Information

Choice experiments and the CVM are based on the random utility model (RUM). The RUM describes the decision-making process and demand for any good as a choice among alternate or substitute goods. Consumer sovereignty considers individuals to be rational and hold well-formed preferences that leave them the best judges of their own utility maximization (Freeman, 1993). Individual utility maximization is accomplished by choosing among alternatives (or world states) defined in terms of attributes and levels of provision according to particular preferences (Hanley, 1998).

Choice Experiment valuation techniques may be analyzed using the RUM, which is a probabilistic choice model, based on certain assumptions related to how individuals' evaluate alternatives (Batsell and Louviere, 1991). The choice of an alternative represents a discrete choice from a set of alternatives. Each alternative is represented by a utility function that consists of a deterministic (systematic) component and a random (stochastic) component, which reflects the idiosyncrasies in the task. For a representative individual, the utility, U, of alternative i is expressed as:

$$U_i = U(A_i) \tag{1}$$

Where A is a vector of alternative specific attributes. The set of all possible alternatives from which i is selected is defined as C (choice set) that has more than one member. Subordinate to the dictates of utility maximization, the individual will select alternative i if

$$U_i > U_j, \forall j \neq i; i, j \in C \tag{2}$$

The Utility (U) is modeled as a random variable and is the sum of the observable (deterministic) and unobservable (stochastic) components of total utility.

$$U_i = V_i + \varepsilon_i \qquad\qquad (3)$$

Where V_i, is the deterministic component and ε_i, is the random disturbance.[60]

$$V_i = \sum_{k=1}^{K} \beta_k A_{ik} \qquad\qquad (4)$$

If the utility is assumed to be a random variable, then the RUM will only provide a probability with which alternatives are chosen. Hence, the probability that an individual chooses alternative i is equivalent to the probability that the utility of alternative i is greater than the utilities of the other alternatives in the choice set.

$$P(i\,|\,C) = P(V_i + \varepsilon_i > V_j + \varepsilon_i,\ \forall\ j \neq i, j \in C\,) \qquad\qquad (5)$$

The probability function, $P(i|C)$, is a complicated function of the attributes which has no closed form but may be simplified to a more tractable form with certain assumptions. Assuming a type I extreme value distribution[61] for the error terms and that the axiom of Independence for Irrelevant Alternatives (IIA) holds, the probability function can be represented by a logistic distribution (Louviere et al., 2000). The IIA property assumes the utility is the relative scale of each alternative and that it depends solely on the attributes of that alternative and on individual characteristics, and not on the nature of the choice set C or attributes of other alternatives (Ben-Akiva and Lerman, 1985; McFadden, 1986).[62]

Different probabilistic choice models may be derived by making different assumptions about the distribution of the error term or random component (Adamowicz

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[60] Four sources of this random disturbance are: unobserved tastes, unobserved attributes, measurement errors, and model mis-specification (Ben-Akiva and Lerman, 1985).
[61] Also known as Gumbel, Weibull or double exponential.
[62] Ratio of probability for any two alternatives is unaffected by adding or subtracting of attributes.

et al., 1997). [63] The Conditional (Multinomial) Logit (MNL) model is the most widely used of all the models (Ben-Akiva and Lerman, 1985; McFadden, 1986). Thus, most discrete choice models are variants of the MNL. Surveys are designed to occasion single or repeated choices among sets of multiattribute alternatives. The set of alternatives, C_n, contains n members, each holding a different combination of levels or values of a set of multiple attributes. Every member of C is described by a combination of levels of k attributes denoted by the vector $\mathbf{X} = (x_1, x_2, ..., x_k)$. It is presumed that each alternative within the choice set has some value or utility, represented by, V_i. These scale values measure the utility of each alternative and are a function of the vector of attributes ($\mathbf{X}$) of the alternative. Hence, the utility function has the following form:

$$V_i = \beta_0 + \sum_{n=1}^{k} \beta_i X_i + \varepsilon_k \quad \equiv \mu \beta' X_i \qquad (6)$$

where β_i is the weight of attribute k in the valuation of alternative i.

The MNL form of the probability estimator, which results from type 1 extreme value assumption for error distribution has the form:

$$prob(i \mid C) = \frac{e^{V_i}}{\sum_{j \in C_n} e^{V_j}} \quad \equiv \frac{e^{\mu X_i \beta}}{\sum_{j \in C_n} e^{\mu X_j \beta}} \qquad (7)$$

Where μ's denote scale values[64] which are approximately equal to the inverse of variance and the $\beta' X_i$ is the utility index.

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[63] Some examples include the bivariate normal distribution yielding a binary probit model, the Gumbel distribution for a Multinomial Logit (MNL), and a generalized Extreme Value distribution gives the Nested MNL

[64] The scale parameter cannot be identified for any single sample and therefore assumed to be one. In order to estimate you must specify one X vector to 1 for all q or else the sets of measurements are perfectly collinear and no estimators can be obtained.

4.3.1 Estimation of MNL Choice Model

The estimation of the MNL choice models may be accomplished by several methods. The most commonly applied is the log likelihood estimation technique that maximizes the following form:

$$L = \prod_{n=1}^{N} \prod_{i=C_n}^{I} P_{jn}^{f_{in}} \tag{8}$$

Where a sample of N individuals can select from among i alternatives and $f_{in} = 1$ if individual n chooses alternative i, and otherwise $f_{in} = 0$ (f_{in} is a dummy variable). Transforming equation 8 into a log likelihood function gives the following:

$$L^* = \sum_{n=1}^{N} \sum_{i=C_n}^{J} f_{in} \ln P_{jn} \quad (\text{where } P_{jn} = prob(i \mid C) = \frac{e^{Vi}}{\sum_{j \in Cn} e^{V_j}}) \tag{9}$$

The L* is maximized with respect to the parameter estimates. The V is typically specified as a linear function (but other functional forms may also apply) to the attributes in each alternative. The estimation of the parameters in this case is through the maximum likelihood (ML) function achieved by the computer program GAUSS (Aptech Systems, 1995).

4.3.2 Estimation of Joint Models

The estimation of the Joint Models is an extension of the previous theory. When using a single data set to estimate a model, the μ is confounded with the parameter vector and cannot be identified (Haener et al., 2000). Any particular scale factor and parameters of its associated choice model are inseparable and multiplicative ($\mu\beta$), where β is some parameter vector. Thus, it is not possible to identify a scale factor within a particular data source (i.e., a second data source is required) (Louviere et al., 2000). Moreover, the scale parameter associated with any data source affects the values of the estimated parameters and therefore parameters from separate data sources cannot be directly compared.

If two complementary samples are jointly estimated, then a ratio of scale parameters can be determined (Haener et al., 2000). The parameter vectors between two groups or data samples differ by a scale or factor of proportionality. Since the scale parameter is inversely related to error variance, two samples also exhibit different levels of error variance in their choices. Equation 10 below illustrates the relative scale and variance for two samples of data (e.g. A and B) where σ represents the variance and μ the scale.

$$\frac{\sigma_A^2}{\sigma_B^2} = \frac{\pi^2/6\mu_A^2}{\pi^2/6\mu_B^2} = \frac{\mu_B^2}{\mu_A^2} = \left(\frac{\mu_B}{\mu_A}\right)^2 \tag{10}$$

The attractive aspect of joint data (combining two or more data sets) with estimation is the opportunity to consider the relative scale factor (inverse of variance) between the different groups. By estimating a joint model one may test whether the parameter vectors of two data sets are jointly equal within a factor of scale. In addition, if parameter equality does not hold then the scale parameter (whether significant or not) cannot be interpreted as representing the true scale ratio (Louviere et al., 2000). The Likelihood function used in the joint conditional logit models is found in Equation 11 below – this form may also be generalized for greater than two groups (not shown).

$$L(\beta, Z^A, Z^B, \tau) = \sum_{n=1}^{N^A} \sum_{i \in C_n} f_{in}^A \ln \Pr\{i \,|\beta, Z^A\} + \sum_{n=1}^{N^B} \sum_{i \in C_n} f_{in}^B \ln \Pr\{i \,|\, \beta, Z^B, \tau\} \tag{11}$$

Where n indexes individuals from A and B samples (e.g. GP 1 and GP 2); i indexes alternatives; f_{in}^A, f_{in}^B are the frequencies of choice in the A and B sample observations; $\Pr\{i \mid \beta, Z^A\}$ and $\Pr\{i \mid \beta, Z^B, \tau\}$ are the probabilities of an individual n choosing alternative i in the A and B samples; β is the parameter vector common between the A and B data which is restricted to be equal in estimation; Z^A and Z^B are parameter vectors associated with variables unique to the A and B data; and τ represents μ_B/μ_A, or the ratio of the scale of the B data to that of the A data (i.e. of the two data sets being considered).

4.3.3 Welfare Measures

In order to understand the economic impacts of changing attribute levels it is necessary to be able to evaluate all the attributes in monetary terms. This 'welfare measurement' is the amount individuals are WTP for either quality or quantity changes. In assessing the economic welfare impact of an environmental change, we compare the initial utility before the change with the subsequent utility level according to the general welfare expression:

$$V^0 = V(M - P, Q) = V(M - CV - P, Q^1) = V^1 \qquad \text{(12)}$$

- Where V^0 is the initial utility including income (M), price (P) and a generic quality factor (Q).

- In the example above Q to Q^1 would represent an improvement in environmental quality. Therefore, the compensating variation (CV) is the price paid (in this case) for the quality improvement to maintain a constant utility throughout time (where $V^0 = V^1$).

This final expression may be used by land mangers in assisting them with decisions (e.g. decision support system) referring to the different impacts of various alternatives.

5.0 Results and Discussion

The results are discussed in three separate sections. The first section gives an overview of the group composition and demographics. The second section discusses the PIW exercises and results that predominantly rest on the AB survey completed prior to the CE. The third section considers the findings of the CE and the modelling.

5.1 Group Demographics

All three groups completed a demographic section in the survey (results in Table 5.1). Typical public advisory group members are, on average, older in age, contain fewer women, have a higher education level and have a higher household income than the provincial average (McFarlane and Boxall, 2000). This research found a similar pattern for all three groups compared to the provincial average. The mean (and median) group age is very similar between GP 1 and GP 2. Group three's mean age is slightly older with a mean age of 49 years old and a median of 51 versus GP 1 and GP 2 mean at about 45.5 and median age at 43 (although not statistically different). The number of women was greatest in the second group at 45 % and the lowest in GP 3 at 21 %. Education, although not statistically significant, was slightly higher in GP 2 at a level six which corresponds to having some university training. The median education for groups 1 & 3 was roughly the same at level 5 (some technical schooling or community college). Median income was highest in groups 1 & 3 at 65,000 and 70,000 dollars per year respectively and lowest in GP 2 at 40,000 dollars per year yet again, not statistically different). The natural resource dependency was greatest in GP 2 at 72 % and lowest in GP 3 at 32 %. Membership in natural history or birdwatching organizations was highest in GP 2 at 18 %, while GP 1 & GP 3 was at around 10 %. Hunting and fishing organization membership was highest in GP 3 at 58 % with GP 1 at 54 % and GP 2 the lowest at 45 %. Finally, the environmental or conservation group membership was approximately 40 % in all three groups. In general these groups are reasonably similar in demographic variables although group 1 & 3 are more similar to each other than to GP 2. Group 2 distinguishes and contrasts itself in having the most women, slightly lower income and slightly higher education, and greater natural resource dependence.

Table 5.1 Group Demographics.

Demographic variable	Sask.	Group 1	Group 2	Group 3
Number in Group	NA	13	11	19
Mean and Median (Std Dev) Age	Mean age 35.7	45.2 43 (16.9)	46.9 44 (12.2)	48.8 51 (11)
Number of Women	50.6 %	4 (31%)	5 (45%)	4 (21%)
Number of Men	49.4 %	9 (69%)	6 (55%)	15 (79%)
Median Education* (Std Dev)	4	5 (2)	6 (2.25)	5 (1.83)
Median Household Income $ (Std Dev)	22,541	65,000 (35,000)	40,000 (18,700)	70,000 (32,000)
Number dependent on Oil &Gas, Forestry, Mining, etc.	NA	6 (46%)	8 (72%)	6 (32%)
Natural History, Birdwatching, etc. Organizations	NA	1 (8%)	2 (18%)	2 (11%)
Hunting/Fishing organizations	NA	7 (54%)	5 (45%)	11 (58%)
Environmental or Conservation Gp Membership	NA	5 (38%)	5 (45%)	8 (42%)

* Education was recorded by a category of increasing levels. See appendix for survey and scale used.
NA – not applicable

5.2 PIW Results

One of the first exercises completed in the PIW sessions, following the introductions and explanation of research objectives, was a forestry familiarity assessment (FFA). This FFA was a series of fourteen true/false questions anonymously completed by each individual. This assessment was aimed to gauge the individual and group level of knowledge and awareness with respect to forestry operations in the NorSask region. This tool was used to promote survey completion skills and ensure the groups were similar but not used to segment the population in econometric analysis.

Only groups 1 & 2 participated in PIWs and completed the FFA (Table 5.2). Although no statistical difference, GP 1 had a slightly lower mean (7.5/14 or 54 % correct), median (7), and mode (6) than GP 2 (8.1/14 or 58 % correct, 9, and 9 respectively). The range of correct answers was also wider in GP 1 at 11 versus GP 2 at 9. The maximum number of correct answers was highest in GP 1 at 13 compared to GP 2 at 11. Collectively, GP 2 appears to be slightly more informed than GP 1 according to the anecdotal experience of the researchers in the central facility and there is less

variation in their responses (range slightly smaller; standard deviation not significantly different), albeit there is not statistical difference between the two groups. On the whole, GP 2 distinguished itself by raising many sophisticated issues and concerns during the PIW discourse and demonstrated a firm grasp on current forestry and landscape issues.

Table 5.2 Group results of Forestry Familiarity Assessments.

	Group 1	Group 2	Group 3
Mean	7.53	8.08	
Median	7	9	
Mode	6	9	
Standard Deviation	2.7	2.5	NA*
Range	11	9	
Minimum	2	2	
Maximum	13	11	

T (means) and F (variances) Tests (alpha = 0.05) results show no significant difference between GP 1 & 2.

* NA – Not Applicable

5.2.1 Group 1 PIW results

Group one was charged with identifying, conceptualizing, and clarifying the description of the attributes. The number of potential attributes for the NorSask forest is very large. In order to keep the survey manageable in complexity (in design and response) the number of attributes was constrained to around six or eight. Ostensibly, while considering landscape level attributes many other attributes are subsumed in these greater categories (e.g. through protecting caribou or "special species" you protect a certain degree of biodiversity).

A ranking and rating exercise was used to prioritize the provisional attributes (Figure 5.1). The attributes collected from the first PIW were combined into eight umbrella categories to be used in the survey. In order to prioritize and possibly reduce the number of attributes a ranking and rating exercise was used as two different ways to achieve this objective. It was noted from this exercise that in both the ranking and the

rating tasks, access and recreation were the lowest in importance.[65] This information provided a legitimate reason for combining these two attributes into a single attribute for the survey. All GP 1 PIW members were contacted by telephone and informed of this consensus finding. Each participant was then informed of the intention to combine these two attributes into a single attribute and the group sanctioned this survey amendment.
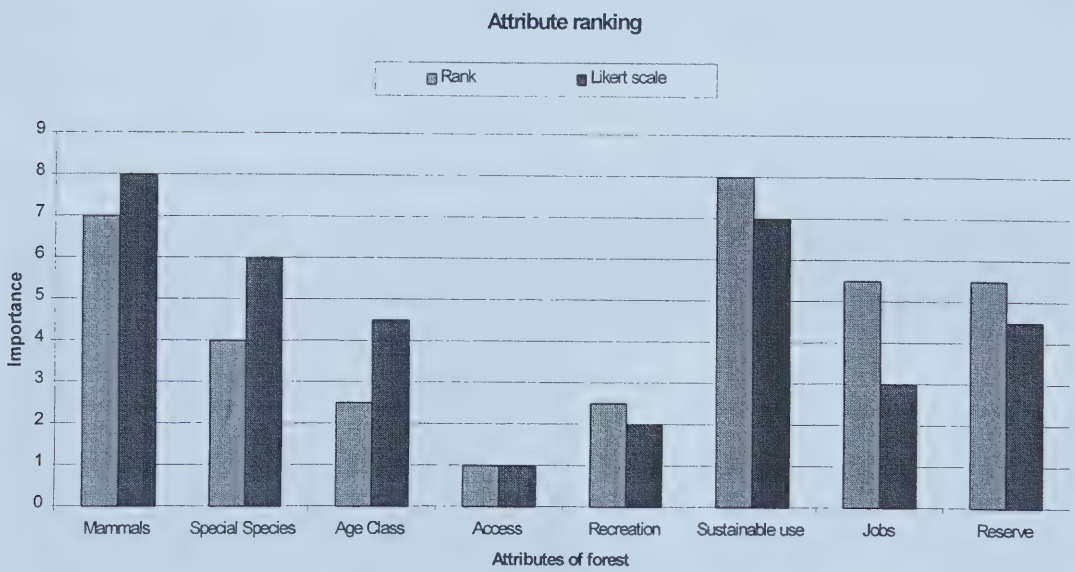
Attribute ranking

Figure 5.1 Attribute ranking and rating (Likert scale) results.

5.2.2 The Attitudes and Beliefs Survey

The AB survey was used to promote further survey completion skills while eliciting more emotive responses to the statements presented. The following measures of central tendency in Tables 5.3 to 5.10 below are derived from the amount of agreement or disagreement with the adjacent statement (i.e., read from highest agreement to lowest).

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[65] This "importance" was in reference to how important it was to the respondents *to have a high level* of this attribute (i.e. a high level of access). Access was seen as very important to wildlife and habitat viability and limiting the access was understood as important to limit stress on these resources.

Only groups 1 & 2 were given these general questions, as the mail survey was kept parsimonious in an attempt to increase response rate. The first set of statements was very general and was aimed as a warm-up. These statements examined the human place in nature, the role of economics in a "successful" life, and what is the role and limits of technology. The two groups had very similar responses and agreed with the idea that economic success was linked to human happiness. The groups disagreed with the statements claiming technology as a panacea, that human population is not a concern, and notions of expertism in solving social problems (Table 5.3). There were no significant differences between the two groups (GP 1 & GP 2).

Table 5.3 General worldview questions.

Section I – General Questions Scale - 1 (totally disagree) to 5 (totally agree)	GP 1	GP 2	GP 3	Overall Combined
Statement	Mean (Std Dev)*			
Agreement				
Human happiness is linked to economic success	3.71 (0.9)	2.82 (1.6)		3.32 (1.3)
The economy can and should continue to grow indefinitely	3.14 (1.5)	2.60 (1.6)		2.92 (1.5)
Human knowledge should seek to understand and then control most natural processes in the environment	3.0 (1.2)	2.8 (1.1)		2.92 (1.2)
Disagreement				
Technology can and will solve most of the problems faced by people	2.20 (0.9)	2.20 (1.1)	NA	2.20 (1.0)
Human population is not limited by the environment but rather technological innovations	2.27 (0.6)	1.6 (0.6)		2.08 (0.6)
Human population is only a problem because of starving people	1.43 (0.8)	1.44 (0.5)		1.43 (0.7)
Environmental issues should be solved by "experts" and the public need only be educated and informed of the decisions	1.33 (1.5)	1.27 (0.8)		1.31 (1.3)

* T-test results between groups 1 & 2 showed no significant differences.

The AB survey contained a ranking task in which each individual respondent was asked to rank order six statements (see Table 5.4). The combined results for each group were very similar. First priority in all cases was the benefits of clean air, water, and wildlife habitat. The lowest priority in rank was the social benefits such as recreation and relaxation (this may further explain the previous willingness to restrict recreation and

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access to ensure environmental integrity). Wealth and jobs were ranked second lowest, while maintaining global ecosystems was second highest overall.

Some individual group differences in the ranking exercise did occur. Group 1 ranked environmental benefits and maintaining global ecosystems equally important as the first choice. Group 1 and 2 had very similar rankings with only their third and fifth choices in reversed positions. The mail survey of GP 3 deviated from the other two groups most notably by ranking the maintenance of global ecosystems sixth (or last) compared to GP 1 and 2 which ranked this as a either a first or second priority.

Table 5.4 Ranked importance of environmental attributes according to combined group results.

Section II – Ranking from 1 (most important) through 6 (least important) Statement	Group 1	Group 2	Group 3	Overall Combined Ranking
Environmental benefits i.e. clean air, water & wildlife habitat	1	1	1	1
Maintaining the global ecosystem	1	2	6	2
Wilderness preservation	4	4	2	3
As a place for a variety of animal and plant life	5	3	3	4
Economic benefits such as wealth and jobs	3	5	5	5
Social benefits such as recreation and relaxation	6	6	4	6

The perceived threats to the boreal forest were determined from the reaction to the statements in Table 5.5. The highest threat was considered coming from the amount of trees being logged, logging practices, and the amount of allocated land to industry for timber harvesting. The lowest threats were perceived as coming from recreation, insects and disease, and negative publicity about forest management. Medium risks were considered from oil and gas exploration, forest fires, and loss of forested land due to agriculture and urbanization.

The differences between groups (see Table 5.6) were few, however GP 3 showed a significantly higher concern for the threat of negative publicity about forest management compared to GP 2. Finally, GP 2 felt that the amount of recreation use occurring in the forest was a significantly greater threat than that indicated by GP 1.

Table 5.5 Perceived threats to the boreal forest.

Section III – Perceived long-term threats Scale 1 (Not a threat) to 4 (A great threat)	GP 1	GP 2	GP 3	Combined
Statement	Mean (Std Dev)			
The amount of trees being logged	3.47 (0.92)	3.64 (0.5)	3.40 (0.71)	3.47 (0.73)
Logging practices	3.20 (0.86)	3.45 (0.52)	3.12 (0.78)	3.22 (0.76)
The amount of forested land in the province allocated for timber harvesting	3.21 (0.97)	3.30 (0.95)	2.92 (0.97)	3.08 (0.96)
Climate change or global warming	3.14 (1.03)	2.82 (0.87)	3.04 (0.98)	3.02 (0.96)
Loss of forested land for other purposes such as agriculture or urbanization	2.73 (1.1)	2.9 (0.99)	3.12 (0.88)	2.96 (0.97)
Forest fires	2.87(0.83)	2.64 (0.81)	2.88 (0.97)	2.82 (0.89)
Oil and gas exploration and pipelines	2.67 (0.62)	2.82 (0.75)	2.60 (0.91)	2.67 (0.79)
Negative publicity about forest management	2.36 (0.84)	2.33 (1.22)	2.92 (0.91)	2.65 (0.98)
Insects and diseases	2.67 (0.62)	2.60 (0.84)	2.62 (0.58)	2.62 (0.64)
The amount of recreation use occurring in the forest	1.71 (0.61)	2.45 (0.93)	2.04 (0.61)	2.04 (0.73)

Table 5.6 T-tests for differences in means between groups (bold indicates significant at alpha = 0.05)

Statement	GP 1+2	GP 1+3	GP 2+3
The amount of trees being logged	-0.60	0.24	1.13
Logging practices	-0.93	0.29	1.51
The amount of forested land in the province allocated for timber harvesting	-0.22	0.91	1.07
Climate change or global warming	0.85	0.31	-0.68
Loss of forested land for other purposes such as agriculture or urbanization	-0.39	-1.16	-0.61
Forest fires	0.71	-0.05	-0.78
Oil and gas exploration and pipelines	-0.54	0.27	0.75
Negative publicity about forest management	0.05	**-1.95**	-1.31
Insects and diseases	0.21	0.34	0.0
The amount of recreation use occurring in the forest	**-2.27**	-1.6	1.35

The questions relating to *how people feel about forests* (Table 5.7) revealed that participants felt very strongly about the existence of the forest (now and for the future) and that forests let people feel close to nature and give spiritual meaning. There was also, albeit weaker, agreement with the statement that human management and needs may be met through the use of the forest. At the other end of the spectrum, people disagreed strongly with the statements about forests existing mostly to serve human needs, and that forests not being used for human benefits are a waste of resources. These statements are strong indicators that there are passive-use values (e.g. existence, bequest) for the forest beyond the use (instrumental) values.

Table 5.7 Participants' feelings towards forests.

Section IV Scale 1 (totally disagree) to 5 (totally agree) Statement	GP 1	GP 2	GP 3	Combined
Agreement	Mean (Std Dev)			
It is important to maintain forests for future generations	5.0 (0)	5.0 (0)	4.92 (0.3)	4.97 (0.2)
Whether or not I get to visit the forest as much as I like, it is important for me to know that forests exist in NW Saskatchewan	4.60 (1.2)	5.0 (0)	5.0 (0.4)	4.93 (0.7)
Forests let us feel close to nature and rejuvenate the human spirit	4.57 (0.9)	5.0 (0.5)	4.68 (0.5)	4.75 (0.7)
Humans should have more respect and admiration for the forests	4.0 (1.0)	4.64 0.9)	4.63 (0.6)	4.44 (0.9)
If forests are not threatened by human actions, we should use them to add to the quality of human life	4.0 (1.2)	4.0 (1.2)	4.60 (0.9)	4.29 (1.1)
Forests can be improved through management by humans	4.10 (1.0)	3.91 (1.2)	4.25 (0.9)	4.12 (1.0)
Forests are sacred places and give us a sense of peace and well-being	3.72 (1.3)	4.54 (0.6)	4.0 (1.3)	4.05 (1.2)
Wildlife, plants, and humans should have equal rights to live and develop	3.27 (1.5)	4.0 (1.2)	4.1 (1.3)	3.82 (1.4)
Forests should have the right to exist for their own sake, regardless of human concerns and uses	3.21 (1.5)	4.30 (1.3)	3.80 (1.3)	3.77 (1.4)
Forests should be managed to meet as many human needs as possible	3.93 (0.9)	3.10 (0.9)	4.0 (1.3)	3.68 (1.5)
Disagreement				
The primary function of forests should be for the products and services that are useful to humans	2.80 (1.3)	2.30 (1.3)	1.8 (0.9)	2.18 (1.2)
Forests should be left to grow, develop, and succumb to natural forces without being managed by humans	2.07 (1.0)	2.36 (1.1)	1.92 (0.8)	2.12 (0.9)
Forests should exist mainly to serve human needs, if not then it is a waste of our natural resources	2.28 (1.4)	1.68 (1.2)	1.60 (1.1)	1.89 (1.3)

The differences amongst the groups in their feelings towards the forest are interesting in that they occur only between GPs 1 & 2 and 1 & 3 (Table 5.8). The significant differences between GP 1 & 2 are in the statements where GP 2 expressed greater agreement in areas of forests providing peace and well-being, having sacredness and having the right to exist for their own sake. The difference between GP 1 & 3 also suggest GP 3 to be more in agreement with the statements suggesting greater 'rights' conferred on the forest such as respect and admiration versus human exploitation and instrumental use. Both of these groups (GP 2 and 3), by this scale, would then tend to be more biocentric in values orientation and less anthropocentric in comparison to GP 1.

The opinions about *forest management in Saskatchewan* reflected a grave concern over industrial control of the forests (i.e., not enough community or local control), issues relating to sustainability, environmental quality, future generations, the amount of protected area, and whether there will be enough trees for future timber demands (Table 5.9).

Table 5.8 T-tests for differences in means between groups (bold indicates significant at alpha = 0.05).

Statement (feel toward forests)	GP 1+2 t-stat	GP 1+3 t-stat	GP 2+3 t-stat
It is important to maintain forests for future generations	0.0	1.4	1.4
Whether or not I get to visit the forest as much as I like, it is important for me to know that forests exist in NW Saskatchewan	-1.31	-1.01	0.16
Forests let us feel close to nature and rejuvenate the human spirit	**-2.73**	**-2.48**	0.54
Forests are sacred places and give us a sense of peace and well-being	**-2.95**	-0.77	1.9
Humans should have more respect and admiration for the forests	-1.67	**-2.2**	0.04
If forests are not threatened by human actions, we should use them to add to the quality of human life	0.0	-1.61	-1.34
Forests can be improved through management by humans	0.4	-0.56	-0.87
Wildlife, plants, and humans should have equal rights to live and develop	-1.31	-1.73	-0.2
Forests should have the right to exist for their own sake, regardless of human concerns and uses	**-2.29**	-0.91	1.6
Forests should be managed to meet as many human needs as possible	1.6	0.22	-1.55
The primary function of forests should be for the products and services that are useful to humans	0.94	**2.6**	1.1
Forests should be left to grow, develop, and succumb to natural forces without being managed by humans	-0.7	0.6	1.3
Forests should exist mainly to serve human needs, if not then it is a waste of our natural resources	1.7	**1.98**	0.24

Table 5.9 Participants' opinions on forest management in Saskatchewan.

Section V Scale 1 (totally disagree) to 5 (totally agree)	GP 1	GP 2	GP 3	Combined
How you *feel* toward the Statement	Mean (Std Dev)			
Agreement				
Forest management should try to minimize impacts on traditional rural ways of life (e.g. hunting and fishing for food)	4 (1.10)	4.36 (0.92)	4.64 (0.96)	4.4 (1.00)
The forest industry controls too much of Saskatchewan's forests	4.1 (1.34)	4.18 (1.20)	4.17 (1.03)	4.14 (1.14)
The present rate of logging is too great to sustain our forests in the future	3.93 (1.43)	4.20 (1.03)	3.90 (1.28)	3.95 (1.26)
When making forest decisions, the concerns of communities close to the forest should be given higher priority than other distant communities	3.86 (1.23)	3.73 (1.42)	4.04 (1.12)	3.92 (1.21)
Forest management should try to create more jobs through (you may circle the preferred method(s) if stated here) commercial recreation and tourism, harvesting plant and animal products, mining, etc	4.07 (1.14)	3.90 (1.10)	3.88 (1.27)	3.94 (1.20)
Forest are being managed for a wide range of uses and values, not just timber	3.88 (1.21)	3.36 (1.21)	3.84 (1.28)	3.72 (1.23)
Forest management does a good job at including environmental concerns	3.0 (1.46)	2.81 (1.25)	3.04 (1.33)	2.98 (1.33)
Communities that depend on the forest for their economic well-being are given adequate consideration in forest management	3.13 (1.55)	2.64 (1.03)	2.87 (1.25)	2.90 (1.3)
Economic stability of communities is more important than setting aside forests from logging	3.14 (1.29)	2.64 (1.29)	2.44 (1.36)	2.68 (1.33)
Forests are being managed successfully for the benefit of future generations	3.0 (1.31)	2.0 (1.0)	2.65 (1.4)	2.61 (1.32)
There will be sufficient wood in Saskatchewan to meet our future needs	3.40 (2.10)	1.91 (1.14)	2.32 (1.14)	2.56 (1.58)
Disagreement				
Forestry practices generally produce few long-term negative effects on the environment	2.67 (1.45)	1.60 (0.97)	2.54 (1.47)	2.39 (1.41)
Saskatchewan has enough protected areas such as provincial and national parks or wilderness areas	3.14 (1.56)	1.82 (1.25)	2.17 (1.38)	2.38 (1.48)
Enough harvested trees are being replaced by planting new ones or by natural seeding to meet our future needs	2.93 (1.44)	1.60 (0.70)	2.28 (1.46)	2.34 (1.40)
The citizens of Saskatchewan have enough say in forest management	3.0 (1.46)	1.44 (0.53)	2.04 (1.04)	2.23 (1.24)
The economic benefits from forestry usually outweigh any negative consequences	2.47 (1.30)	1.45 (0.69)	2.33 (1.52)	2.18 (1.35)

Table 5.10 T-tests for differences between groups (bold indicates significant at alpha = 0.05)

Statement (Opinions about forest management)	Group 1+2 t-stat	Group 1+3 t-stat	Group 2+3 t-stat
Forest management should try to minimize impacts on traditional rural ways of life (e.g. hunting and fishing for food)	-0.9	-1.4	-0.34
The forest industry controls too much of Saskatchewan's forests	-0.23	-0.69	-0.40
The present rate of logging is too great to sustain our forests in the future	-0.54	-0.25	0.35
When making forest decisions, the concerns of communities close to the forest should be given higher priority than other distant communities	0.24	-0.67	-0.8
Forest management should try to create more jobs through (you may circle the preferred method(s) if stated here) commercial recreation and tourism, harvesting plant and animal products, mining, etc	0.37	0.59	0.15
Forest are being managed for a wide range of uses and values, not just timber	0.91	-0.1	-1.07
Forest management does a good job at including environmental concerns	0.34	0.0	-0.39
Communities that depend on the forest for their economic well-being are given adequate consideration in forest management	0.98	0.55	-0.58
Economic stability of communities is more important than setting aside forests from logging	0.98	1.6	0.41
Forests are being managed successfully for the benefit of future generations	**2.21**	0.68	-1.66
There will be sufficient wood in Saskatchewan to meet our future needs	**2.35**	**2.1**	-0.65
Enough harvested trees are being replaced by planting new ones or by natural seeding to meet our future needs	**3.1**	1.4	**-1.9**
Forestry practices generally produce few long-term negative effects on the environment	**2.21**	0.26	**-2.2**
Saskatchewan has enough protected areas such as provincial and national parks or wilderness areas	**2.35**	**2.1**	-0.57
The economic benefits from forestry usually outweigh any negative consequences	**2.56**	0.29	**-2.35**
The citizens of Saskatchewan have enough say in forest management	**3.73**	**2.21**	**-2.2**

Opinions with respect to forest management varied between the groups and the greatest number of differences was between GP 1 & 2 at seven (Table 5.10). In general, GP 2 is much more critical of forest management in Saskatchewan than GP 1. Virtually all the statements that were disagreed to by all the groups – GP 2 showed a significantly greater level of disagreement than GP 1. Group 1 & 3 had significant differences in only three disagreement statements where once again GP 3 disagreed more strongly than GP 1. Finally, GP 2 & 3 had significant differences in three statements that were again found in

the overall disagreement statements. Group 2 once again disagreed with the statements more strongly than that of GP 3. From these results it may be interpreted that GP 2 was the most critical of present forest management practices in Saskatchewan, GP 3 the next most, and GP 1 the least critical of all three groups. However, all three groups were critical of forest management and this may not necessarily reflect on Mistik management but rather all forestry operators and the governments role in policy.

The issue of sustainability, despite its mounting cliché status, is a very important issue in forest management and a large concern to the public (Table 5.11). All three groups overwhelmingly (forty to seventy percent) felt present forest management in Saskatchewan was not sustainable. Roughly ten to fifteen percent felt it was sustainable, and ten to thirty percent were unsure. This was a common and recurrent theme voiced in the PIWs and written in the comments section of the surveys. The public we surveyed was dubious of present harvesting practices and its ability to meet future timber demands due to observed slow forest regeneration, poor soil productivity, environmental degradation, and ever-advancing technology – irrespective of increasing non-industrial demands placed on the same landbase. The burgeoning number of definitions for "sustainability" were not broached but rather left to the respondents' intuition.[66]

Table 5.11 Group responses to forest sustainability question.

Group Number	Number of respondents	Answered 'No', do not believe sustainable	Answered 'Yes', do believe sustainable	Unsure	No answer
1	16*	6 (38%)	2 (12.5%)	2 (12.5%)	6 (38%)
2	10*	7 (70%)	1 (10%)	1 (10%)	1 (10%)
3	19	9 (47%)	3 (16%)	6 (32%)	1 (5%)
Totals	45	22 (49 %)	6 (13%)	9 (20%)	8 (18%)

* NOTE: Not all the survey respondents answered the questions. For comments refer to Appendix A.

[66] The responses indicated the predominant interpretation was timber "sustainability" and even this was perceived as not sustainable; let alone the wider definition including economic, ecologic, and social sustainability.

The AB survey (in the two PIW groups) was aimed at stimulating thought and interest in the process, providing an initial outlet for feelings and comments before any group dynamics or re-shaping of ideas occurred, population segmentation information, a benchmark for comparison to general population and other FDCs, as a CE survey warm-up exercise and a contrast to the CE in the event one generated a protest response. The instrument was successful in achieving these ends according to the individual comments submitted (see Appendix A). In some cases, respondents declared the AB survey more favorable and effective at eliciting their true feelings and opinions. The AB survey may have had a more cathartic component which comforted some in that they may have felt they "got a lot off their chest" already and could now focus on the other tasks (diminished future protest). Conversely, it may have captured most of what a person had wanted to say and subsequently increased protest toward the CE.

5.3 Choice Experiment Qualitative Results

5.3.1 Survey Completion

The CE part of the survey was the final section to be completed. This section was the most novel, onerous and cognitively challenging to the participants based on response rates, written comments and debriefing opportunities (where applicable). The response rates for the CE were lower vis a vis the AB survey. In a number of cases the individual completed the AB survey but did not complete the CE. The CE survey was accompanied with a glossary that explained and defined the attributes as they were referred to in the choice occasions. Group 1 was well acquainted with the glossary section before completing the survey due to copious discussion over the semantics of descriptions. Group 2 was able to discuss the attributes and wider forestry topics relating to landscape issues before completing the survey. In the mail group it is uncertain how many or whether any respondents read the glossary thoroughly before completing the survey.

The number of individuals invited to attend GP 1 PIW was 25 (Table 5.1). The number that attended and remained committed to the process was 17. Some invited

individuals failed to appear.[67] Group 1 was unique in that the survey the group completed in PIW3 was not the final iteration. This necessitated the final version being mailed to the participants to be completed and returned. Group 1 response rate was 82 % and of the returned surveys 93 % contained usable results. One respondent had lexicographic[68] preferences and these were not used in estimation due to the lack of trade-offs.

In the GP 2 PIW, twenty individuals were invited and 12 attended. All the surveys were returned and only one survey had unusable results (incomplete data). It would appear that once an individual has made the commitment and effort (investment) to attend a PIW, the completion of the survey while at a central location (with the benefit to ask questions and clear confusion) is reasonably straightforward and assured. During the PIW, there seemed to be considerable focus and momentum on the CE task and its completion. Both groups (1 & 2) were given approximately 45 minutes to complete the survey (16 choice tasks), which seemed to be enough time for the majority of the respondents, although some felt they could have done a 'better job' given more time (and some possibly found the forum distracting).

Group 3 was mailed the survey after being contacted by telephone and a verbal agreement to complete and return the survey was established. Some individuals agreed to receive the survey and give their best effort in completing and returning it in the allotted time period.[69] Forty surveys were mailed and 25 (63 %) were returned. Of the 25 returned surveys, 19 (76 %) contained usable results and 6 (24 %) unusable results due to incomplete data. It is apparent that having an individual attend a meeting increases response rate and quality of collected data.

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[67] The fall and early winter season is a very busy time for many in NW Saskatchewan (harvesting, outfitting, curling, conflicting commitments and travel were all cited) and some invited individuals were unable to attend.

[68] Lexicographic preferences means an individual has a hierarchy of attributes and essentially selects the highest or lowest number of the desired attribute according to their preferences. For example, a person may want jobs as a primary attribute and select whatever option has the highest level of jobs in every choice occasion.

[69] The spring and fall time periods are extremely busy for many people in the rural Saskatchewan. Some individuals were very interested but were unable to find the time to complete and return survey. Often the same people are involved in many other community activities and their time constraints are great.

Table 5.12 Group response rates.

Number	Group 1	Group 2	Group 3
Individuals invited to meeting(s)	25	20	NA
Individuals *confirmed* at meeting	17 (68%)	12 (60%)	NA
Individuals mailed the final survey	17	NA*	40
Surveys returned	14 (82%) Mail-out	12 (100 %)	25 (63%)
Returned surveys containing usable results	13 (93%)	11 (92%)	19 (76%)

* NA – Not Applicable

In order to assess the impact of the PIWs on choice certitude (CE), a question pertaining to choice certitude and informational provisions was asked following the survey (Table 5.13). Group 1 was the most certain of their choices with 78 % of the respondents stating they were reasonably certain with their choices compared to GP 2 at 42 %. Additionally, 21 % in GP 1 and 33 % in GP 2 were uncertain with their choices. The higher informational provisions in GP 1 may partially explain this result. In GP 1, 57 % felt they had enough information, while in GP 2 only 33 % stated so. However, nobody in either group stated they did not have enough information in order to make their choices. These questions were not applied to GP 3.

Table 5.13 Group certainty with their choices in the CE.

Group	Number of Respondents	Reasonably certain with choices	Uncertain with choices	Enough Information	Not Enough Information
1	14	11 (78%)	3 (21%)	8* (57%)	None
2	12	5 (42%)	4 (33%)	4 (33%)	None
3			NA		
Totals	26	16 (63%)	7 (27%)	12 (46%)	None

* Other respondents made no comment in regards to information provisions.

Group 1 and 2 were also asked if they felt any information presented or questions asked showed any bias (see Appendix A Table A3 and A8). The majority (67 %) felt

there was no bias, 8 % were unsure, and 21 % felt there was some bias. The bias noted was predominantly in the selection of species to be used as attributes (this bias was said to be understandable though) and in the assumption that forests can be managed and improved through technology and human efforts.

Group 1 was asked to comment on the process and the value of the PIWs. The majority felt they were appropriate, interesting, and worthwhile. Some respondents chose to hold reservations until they observed "what came of the results".

5.3.2 Synopsis of Group Comments

All three groups were afforded plenty of time, writing space, and opportunity to provide comments. The researchers were readily available[70] throughout the process and phone conversations were used to keep the respondents involved and interested between PIWs. Every survey used in this research, there were both direct open-ended questions probing the respondents in addition to space provided for any other comments and concerns. Group 1 clearly had more input opportunities than GP 2 and GP 3 (which had the least). Albeit, all individuals from all three groups were invited to submit any comments or concerns (as an addendum to the survey, or mailed in separately after some reflection) that they felt were not captured in the survey questions and format. A few individuals from GP 1 took advantage of this opportunity and their comments may be found in Appendix A.

5.3.2.1 Group 1

There were many comments relating to all aspects of the PIW process and survey. Detailed comments related to the survey may be read in the appendix. Some comments made note that the survey exercise was hypothetical and therefore the "real" choices and trade-offs may be different. A need to find "balance" in our forest management was a common theme. The PIWs were rated as good, informative, educational, and as an effective means for increasing awareness. The workshops were thought necessary or very helpful in explaining and understanding the survey but that a single workshop may be adequate. The final theme was that industrial interests usually prevail over environmental concerns.

5.3.2.2 Group 2

The comments emanating from GP 2 were somewhat similar to those of GP 1. There was concern over sustainability due to the rapid progress in harvesting technology and yet stubbornly poor regeneration. The profit motive was also seen as jeopardizing the forest and environment. The boreal forest was named as a very important source of peace and tranquillity, spiritual revival, and employment. Concern was also stated for future generations and the role of forests in climate regulation and global warming. Finally, there was distress that the results may never be reflected in the logging practices.

5.3.2.3 Group 3

The comments of GP 3 suggest the same concerns regarding sustainability, regeneration, recent forestry expansion initiatives, labour losses to equipment and nebulous environmental values being subjugated by economic and political interests. Many sentimental values were expressed for such things as wildlife, aesthetics, sacred places, future generations and the forest itself.

5.4 Choice Experiment Survey Completion by Group

Each group completed the same CE component of the survey.[71] Examining how it was completed may give some insight into how the setting or PIW process affected choices or reveal indicators of protest of the CE.

The surveys were individually inspected for the following choice patterns: 1) the percent of respondents who provided no response; 2) offered clearly lexicographic responses; and 3) those who chose only status quo (SQ) choices a 100 % of the time (all 16 choices) to 50 % of the time (8 choices). The status quo option is a vote for the present (or current) situation described in the survey. The results are shown in Table 5.14. The highest number of 'non response' surveys was in the GP 3 *mail-out* at 37.5 % (15 out of 40 surveys), the second highest was GP 1 with 17.6 % (3 out of 17). This might be greeted as somewhat surprising as GP 1 was thought to have the most invested in the process, the greatest trust and rapport with the researchers, and therefore the most interest in the project. Alternatively, the more likely explanation is the mail-out format

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[70] Contact information for the researchers was included in all mailed information and along with an invitation to call throughout the process with any questions or concerns.
[71] Recall the GP 3 mail-out Pre-PIW component was abridged in the survey version

for the final version that may have engendered procrastination and lower response-rates versus central location completion (i.e., recall GP 1 *PIW #3* had a non-response rate of 5.9 % 1 out of 17) where individuals have already committed the time. In addition, this may be explained in terms of process fatigue and the opportunity cost of time as well as all the tangible incentives offered through the process had been realized (i.e. hosting, mileage payment, and gift book). Finally, GP 2 had the lowest non-response percent at 9 % (only 1 out of 11) but was the only group to complete the *final survey* at a central location. Moreover, the length of the GP 3 mail survey was a total of 23 pages[72], which exceeds the twelve pages maximize admonished for mail surveys to optimize response rates (although phone contact before sending the survey should partially nullify this maxim) (Dillman, 1978). This contrasts with the survey completion of GP 1 and GP 2 that was partitioned and completed piecemeal, to decrease the cognitive burden, over a greater period of time.

Table 5.14 Groups CE responses and choices.

Survey Completion Pattern	GP 1 Number (%)	GP 2 Number (%)	GP 3 Number (%)
Number of non-responses	3 (17%)	1 (8 %)	15 (38%)
Number of participants using a status quo response strategy (all 16 choice tasks)	0 (0%)	0 (0%)	6 (15%)
Number of participants using a lexicographic completion strategy	1 (6%)	0 (0%)	0 (0%)
Number of participants with 15 SQ responses	0 (0%)	0 (0%)	0 (0%)
Number of participants with 14 SQ responses	0 (0%)	0 (0%)	0 (0%)
Number of participants with 13 SQ responses	3 (17%)	1 (8 %)	0 (0%)
Number of participants with 12 SQ responses	1 (6%)	0 (0%)	2 (5%)

Considering the CE completion, only one individual from GP 1 chose exclusively according to a lexicographic strategy. Jobs were the most important attribute to this individual and therefore in each case selected the option with the highest number of jobs

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[72] The 23 pages did include 8 pages reading or attribute description that may or may not have been read. It still may have been factored in to a decision about whether to complete the survey or not.

to the other choices offered. This completion strategy is consistent with refusing to make trade-offs and is often interpreted as the survey being either too complex, trade-offs being uncertain or unfamiliar, or simply a form of protest. In any case, there is a precedence for these results to be discarded from the data set in some cases (Adamowicz et al., 1998). The final response to the choice experiment is displayed in Table 5.14 and this includes the number of SQ choices up to twelve. The highest number of 'SQ only' choices was in GP 3, which did not benefit from a PIW to discuss the issues prior to completion or an explanation of the survey design. To reiterate, a high number of SQ responses are interpreted as a form of protest and once again the results are discarded from the data set (Adamowicz et al., 1998). In this research, any surveys that contained greater than 13 tasks completed as SQ were discarded. This only applied to the six surveys from GP 3 that contained 15 out of 16 choices marked as SQ.

Other individual CE choice breakdowns may be found in Appendix A. These figures consider each individual respondent's choices and the attributes that consistently ranked high or low. This information was not used in modelling but did uncover some of the salient attributes and the completion strategies for different individuals.

5.5 Model Estimation Results

Multinomial Logit (Tables 5.17 and 5.18) and Joint models (Tables 5.19 and 5.20) were estimated using GAUSS version 3.2.32 software (Aptech Systems, 1994). Each group was considered alone and then compared to the other groups to determine if the PIW experience(s) had any affect on the CE results. Additionally, Joint models were estimated for the different group combinations and an overall combined model was also estimated. The hypothesis testing from the different models is best described by referencing Table 5.15. The results from the parameter equality tests are found in Table 5.16.

5.5.1 Individual Group Results

5.5.1.1 Linear Models

The parameter estimates for the three MNL models for each group is shown in Table 5.17. A positive and significant utility for the base case (or the status quo situation) is observed in all three groups. This can be considered a form of SQ bias or endowment effect and a feature of these respondents. This SQ bias is a common phenomenon and numerous reasons may explain it such as: mistrust of administration or dubious of ability to bring proposed events to fruition (Adamowicz et al, 1998). Other possible reasons are that the choice task was too complex, trade-offs are uncertain or unfamiliar, or it was simply a form of protest.

The moose and caribou coefficients are positive and significant for all three groups except moose are *not* significant in GP 2. This means group utility is increased with an increase in both moose (except in GP 2) and caribou numbers (i.e., the probability of choosing an alternative increase as the levels increase). Older age-class forest is positive and significant in both GP 2 and 3 at the 5 % level and significant in GP 1 at the 10 % level. Therefore, all three groups would enjoy an increased level of utility with a greater provision of old age-class forest.

The recreation and access attribute was effects coded in Table 5.17.[73] The recreation restrictions and access attribute did not present many significant results. In this model, only three levels showed significant results: level 1 is negative (the two wheel drive access lowers this groups utility) and level 3 is positive (the ATV access was desired) for GP 2 and GP 3. This suggests that overall group utility would increase with greater restrictions on access up to the point of ATV access.

The final three attributes: protected areas, employment, and taxes are all significant in GP 3. Protected areas and employment coefficients are positive and significant, and thus, the subjects desired both in greater amounts. The coefficient on taxes is negative as expected (increased taxes decrease utility "ceteris paribus"). Taxes are also negative and significant for GP 2. A likelihood ratio test (see Louviere et al.,

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[73] Using effects codes means the first three levels are estimated and the fourth is the negative sum (calculated) of the previous three levels (in this case). The advantage of effects codes is that they remove the impact of the factor from the constant and thus make interpretation easier. They are however, statistically identical to dummy variables.

2000) was calculated for each group model (see Table 5.15). The calculated value exceeds the critical value (18) and hence the null hypothesis (of coefficients not being significantly different from zero) is rejected.

5.5.1.2 Quadratic Models

A quadratic form of the conditional utility function estimated (Table 5.18) for each group shows similar findings to the linear models. With quadratic model estimation, each attribute was squared and included in the model to determine if the utility was non-linear (a "threshold" effect). Of all the attributes, only moose and caribou had squared terms that were significant.

In this case, a positive and significant utility for the base case is found in GP 2 alone. As before, the coefficient for moose is positive and significant for only GP 1 and 3. The moose squared coefficient is negative and significant which indicates a decreasing marginal utility (non-linear utility) as the number of moose increase. Similar results and interpretation apply to the caribou coefficients in all three groups. Moose and caribou demonstrate a "threshold" phenomenon in which the number of animals markedly and linearly increases utility to a "threshold" number at which time the utility curve begins to plateau and slowly decrease, hence the negative coefficient on the squared term. No other attributes manifest this threshold effect in estimation. This result had previously been found by Adamowicz et al., 1998b.

Forest age-class (% old) was positive and significant for GP 2 and GP 3. The recreation and access attribute showed limited significance. Group 1 level 3 and GP 2 level 1 were both negative and significant. The calculated value for level 4, in all cases, is positive. The protected areas coefficient is positive and significant in GP 2 and GP 3. Employment is positive and significant for GP 3 in this model. The tax coefficient is again predictably negative and significant in all three groups.

The quadratic model is a better fit of the data than the linear model as the value of the log-likelihood function is larger in each case (see Table 5.18). The rho-squared value is also higher in all cases and thus, this model provides a better explanation of the data. The calculated chi-squared values are greater than the critical value.

5.5.2 Joint Model Results

5.5.2.1 Joint Linear Models

Combining two data sets is a form of data enrichment. However, successful pooling of different data sources involves the restriction that common parameters are equal, while controlling for the scale factor to 1.0 (also explained in chapter 4). Since it is impossible to identify both scale factors, the scale of one data set must be normalized to one (e.g. $\mu^{GP1} \equiv 1$), and the estimate of μ^{GP2} represents a *relative scale* with respect to the GP 1 data scale (i.e. as estimating the GP 1 variance relative to the GP 2 variance ($\sigma^2_{GP1} = \pi^2 / 6$) (Louviere et al., 2000). This analysis allows the different PIW processes and survey completion formats to be evaluated for antecedent stabilization of respondent preferences.

The joint linear models (Table 5.19) for all the group combinations possible showed similar findings as previously discussed. With the combined data, all four groups (1+2, 1+3, 2+3, 1+2+3) showed positive and significant coefficients for the base case, moose, caribou, and protected areas. Only GP 2+3 had a positive and significant coefficient for the recreation/access level 3, level 4 was positive in all group designations. The protected areas coefficient was positive and significant for all four groups while employment was only significant for GP 1+3, 2+3, and 1+2+3. Taxes were negative and significant for GP 1+3, 2+3, and 1+2+3, but not significant in GP 1+2.

All the chi-squared values, except GP 1+3, are greater than the critical value and thus the null hypothesis (that parameter coefficients are equal) is rejected and therefore the coefficients between GP 1 and GP 3 are not significantly different from each other within a factor of scale. It is noted here that the parameters of GP 2 are significantly different from both GP 1 and GP 3 (i.e. there is not preference equality through-out the groups). This corroborates other information gathered from GP 2 (AB survey results, PIW discourse, and demographics).

The scale factors between the different groups may be seen at the bottom of Table 5.19. None of the scale factors in the joint linear models are significantly different from one and therefore no conclusions in terms of how the variance differs between groups

may be drawn. Moreover, due to the parameter inequality of GP 2, no interpretations about the variance are warranted.

5.5.2.2 Joint Quadratic Models

The joint quadratic models (Table 5.20) show the status quo coefficient to be significant for GP 1+2 alone. The moose, caribou, and forest age coefficients are all positive and significant. As before the moose and caribou squared coefficients are negative and significant demonstrating the diminishing marginal utility as the number of moose or caribou cross a "threshold" number signaling the populations are plentiful enough for harvesting or not threatened by extinction. The recreation and access attribute remains largely as not significant. The third level in GP 2+3 shows a positive and significant coefficient but the trend in coefficients does show a negative coefficient for the first two levels with the third and fourth becoming positive. Although these results are not significant statistically, the trend is further corroborated by anecdotal and survey remarks made by the respondents. Other significant results in all the groups are protected areas as positive and taxes as negative. The only significant employment coefficients are the positive ones for GP 1+3 and GP 1+2+3.

Once again, all the chi-squared values, except GP 1+3, are greater than the critical value and the null hypothesis (of preference equality) is rejected. Therefore, the coefficients between GP 1 and GP 3 are not significantly different from each other within a factor of scale (i.e. preference equality). In considering the scale factors only the GP 2+3 and 1+2+3 had significant results. However, due to the parameter inequality of GP 2, no interpretations about the variance are warranted.

The joint quadratic model outperforms the joint linear model as in the earlier case. The log-likelihood is greater than the linear models and the rho-squared values are higher.

5.5.3 Interaction terms and other models

Demographic information from all the groups was interacted with each of the attributes in order to see if any interactions provided a greater explanation of choice. The interactions attempted were: gender, income, education, age, organization(s), and natural resource dependence in employment interacted with each of the attributes to determine if

any were significant (e.g. gender was interacted – multiplied by all the attributes and run in the regression). This was used to determine if gender, for example, was a significant demographic explanator in choice; that men and women made different choices. No consistent pattern emerged throughout any of the models with any of the interaction terms (i.e. different interactions were significant in different groups). Many different combinations[74] of demographic variables were estimated in the models and their additions failed to provide more information and were therefore not included in the final models.[75]

Table 5.15 Hypothesis for the chi-squared tests in the models.

Group	Hypothesis Test For Model	
	Linear	*Quadratic*
1	$H_0 : \beta's = 0 \; H_1 : \beta's \neq 0$	$H_0 : \beta's = 0 \; H_1 : \beta's \neq 0$
2	$H_0 : \beta's = 0 \; H_1 : \beta's \neq 0$	$H_0 : \beta's = 0 \; H_1 : \beta's \neq 0$
3	$H_0 : \beta's = 0 \; H_1 : \beta's \neq 0$	$H_0 : \beta's = 0 \; H_1 : \beta's \neq 0$
Joint Models 1+2	$H_0 : \beta_1's = \mu\beta_2's$ $H_1 : \beta_1's \neq \mu\beta_2's$	$H_0 : \beta_1's = \mu\beta_2's$ $H_1 : \beta_1's \neq \mu\beta_2's$
1+3	$H_0 : \beta_1's = \mu\beta_3's$ $H_1 : \beta_1's \neq \mu\beta_3's$	$H_0 : \beta_1's = \mu\beta_3's$ $H_1 : \beta_1's \neq \mu\beta_3's$
2+3	$H_0 : \beta_2's = \mu\beta_3's$ $H_1 : \beta_2's \neq \mu\beta_3's$	$H_0 : \beta_2's = \mu\beta_3's$ $H_1 : \beta_2's \neq \mu\beta_3's$
1+2+3	$H_0 : \beta_1's = \mu_2\beta_2's = \mu_3\beta_3's$ $H_1 : \beta_1's \neq \mu_2\beta_2's \neq \mu_3\beta_3's$ (μ_2 & μ_3 = relative scale)	$H_0 : \beta_1's = \mu_2\beta_2's = \mu_3\beta_3's$ $H_1 : \beta_1's \neq \mu_2\beta_2's \neq \mu_3\beta_3's$ (μ_2 & μ_3 = relative scale)

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[74] Interaction terms were estimated with a single demographic variable to a few and even many and none of the combinations and permutations were consistent and informative.
[75] To determine whether allowing for preference heterogeneity across individuals improves the models, we estimated random parameters logit models for each group. There was not a significant improvement in model fit for any of the groups so we do not report these results.

Table 5.16 Parameter equality test results.

Model			chi-square (critical chi)
Linear	**LL (U)**	**LL(R)**	
GP 1	-203.07	-228.52	50.9 (18)
GP 2	-174.45	-193.35	37.8 (18)
GP 3	-292.50	-330.70	76.4 (18)
Joint Linear	**LL SUM**	**Joint LL**	
GP 1+2	-377.17	-389.50	24.7 (18)
GP 1+3	-495.57	-499.935	8.7 (18)
GP 2+3	-466.6	-477.53	21.9 (18)
GP 1+2+3	-669.0	-686.41	34.8 (31)
Quadratic	**LL (U)**	**LL(R)**	
GP 1	-185.63	-228.53	85.8 (21)
GP 2	-166.54	-193.34	53.6 (21)
GP 3	-263.01	-330.71	135.4 (21)
Joint Quadratic	**LL SUM**	**Joint LL**	
GP 1+2	-352.1	-366.68	29.2 (21)
GP 1+3	-448.60	-453.51	9.8 (21)
GP 2+3	-429.50	-413.09	32.8 (21)
GP 1+2+3	-615.1	-634.11	38.0 (37)

Table 5.17 Linear models (MNL) for all three groups.

Variable & Description	Group 1 Linear Model (t-stat)	Group 2 Linear Model (t-stat)	Group 3 Linear Model (t-stat)
Base (Intercept)	0.7936 (2.55)*	1.379 (3.722)*	0.770 (3.061)*
Moose*** (Ungulates)	0.1063 (4.104)*	0.0212 (0.764)	0.1181 (5.384)*
Caribou*** (Special Species)	0.4701 (2.32)*	0.48875 (2.212)*	0.6071 (3.533)*
Forest Age *** (% Old)	0.05368 (1.66)**	0.1180 (3.337)*	0.05715 (2.144)*
Recreation & Access			
Recreation 1	0.09406 (0.475)	-0.6293 (-2.75)*	-0.063715 (-0.391)
Recreation 2	0.03139 (0.158)	-0.1672 (-0.783)	-0.15347 (-0.907)
Recreation 3	-0.3378 (-1.574)	0.35267 (1.691)**	0.34236 (2.106)*
Recreation 4 (calc)	0.2123	0.4438	-0.1252
Protected Areas (Above current amount)	0.1978 (1.72)**	0.2127 (1.781)**	0.19514 (2.086)*
Employment*** (Direct and indirect forestry jobs)	0.2122 (1.925)**	-0.06322 (-0.545)	0.230 (2.483)*
Tax *** (Changes in household income)	-0.2705 (-1.385)	-0.3921 (-1.881)**	-0.32274 (-1.975)*
Log-Likelihood	-203.074	-174.45	-292.5
Rho-squared	0.1113	0.09984	0.1155
Chi-squared (Critical value = 18) Degrees of Freedom = 10 (alpha = 0.05)	50.9	37.8	76.4

* All significant results (alpha = 0.05; $t=1.96$)

** significant for (alpha = 0.10; $t=1.65$).

*** Moose and caribou were divided by 1000; Jobs and taxes were divided by 100; and forest age class was multiplied by 100, in all estimations.

Likelihood ratio test via $\{LR = 2[\ln Lu - \ln Lr] \sim \chi^2 (J)\}$ a chi-squared value

Table 5.18 Quadratic models for all three groups.

Variable & Description	Group 1 Quadratic Model (t-stat)	Group 2 Quadratic Model (t-stat)	Group 3 Quadratic Model (t-stat)
Base (Intercept)	0.0607 (0.170)	1.066 (2.638)*	0.06983 (0.248)
Moose*** (Ungulates)	0.5335 (3.689) *	0.08667 (0.703)	0.5495 (4.760)*
Moose Squared	-0.2418E-01 (-3.034)*	-0.4145E-02 (-0.574)	-0.02494 (-3.886)*
Caribou *** (Special Species)	5.291 (4.918)*	4.1398 (3.996)*	6.111 (6.463)*
Caribou squared	-2.6096 (-4.669)*	-2.024 (-3.669)*	-0.2973 (-6.052)*
Forest Age*** (% Old)	0.04962 (1.481)	0.1137 (3.095)*	0.05082 (1.793)**
Forest Age Squared	NS	NS	NS
Recreation & Access Recreation 1	0.1778 (0.837)	-0.6347 (-2.709)*	-0.0433 (-0.246)
Recreation 2	0.4854E-03 (0.002)	-0.1988 (-0.898)	-0.1697 (-0.948)
Recreation 3	-0.4478 (-1.970)*	0.3534 (1.665)**	0.3150 (1.805)**
Recreation 4	0.2695	0.4802	0.10202
Protected Areas (Above current amount)	0.1809 (1.47)	0.2176 (1.732)**	0.20055 (1.97)*
Protected Areas Squared	NS	NS	NS
Employment*** (Direct and indirect forestry jobs)	0.1623 (1.414)	-0.07212 (-0.609)	0.1815 (1.861)**
Employment Squared	NS	NS	NS
Tax *** (Changes in household income)	-0.4694 (-2.101)*	-0.5167 (-2.263)*	-0.5515 (-2.921)*
Tax Squared	NS	NS	NS
Log-Likelihood	-185.63	-166.54	-263.01
Rho-squared	0.188	0.139	0.2047
Chi squared (critical value = 21) Degrees of freedom = 12 (alpha 0.05)	85.8	53.6	135.4

* All significant results (alpha = 0.05; *t=1.96*)
** significant for (alpha = 0.10; *t=1.65*).
*** Moose and caribou were divided by 1000; Jobs and taxes were divided by 100; and forest age class was multiplied by 100, in all estimations.
NS = Not significant – all the attributes were estimated in many different combinations of the quadratic form. Only moose and caribou manifest significant quadratic forms and the other attributes were then included without the squared terms.

Table 5.19 Joint linear models between different groups.

Variable & Description	Group 1+2 Joint Model (t-stat)	Group 1+3 Joint Model (t-stat)	Group 2+3 Joint Model (t-stat)	Group 1+2+3 Joint Model (t-stat)
Base (Intercept)	1.1181 (4.163)*	0.7373 (2.907)*	0.6767 (2.709)*	0.8742 (4.165)*
Moose***(Ungulates)	0.0784 (3.077)*	0.1076 (4.541)*	0.0664 (3.729)*	0.0969 (4.786)*
Caribou *** (Special Species)	0.5212 (3.058)*	0.5234 (3.56)*	0.4223 (2.960)*	0.5428 (4.019)*
Forest Age*** (% Old)	0.085779 (3.276)*	0.05317 (2.518)*	0.05414 (2.372)*	0.06658 (3.290)*
Recreation & Access				
Recreation 1	-0.2197 (-1.353)	-0.0073 (-0.073)	-0.1595 (-1.347)	-0.1154 (-1.037)
Recreation 2	-0.0536 (-0.363)	-0.0853 (-0.636)	-0.1181 (-1.144)	-0.1053 (-0.945)
Recreation 3	-0.0504 (-0.298)	0.0895 (0.792)	0.2461 (2.158)*	0.1385 (1.238)
Recreation 4 (calc)	0.3237	0.0031	0.0315	0.0822
Protected Areas (Above current amount)	0.2205 (2.382)*	0.1824 (2.390)*	0.1426 (2.165)*	0.1939 (2.867)*
Employment*** (Direct and indirect forestry jobs)	0.1029 (1.110)	0.2098 (2.786)*	0.1015 (1.835)**	0.1661 (2.481)*
Tax *** (Changes in household income)	-0.3596 (0.0118)	-0.2911 (-2.215)*	-0.2563 (-2.164)*	-0.3278 (-2.784)*
Scale Group 1	1	1	NA	1
Scale Group 2	0.7597 (-0.812)	NA	1	0.6434 (-1.32)
Scale Group 3	NA	1.0748 (0.266)	1.478 (1.273)	1.0991 (0.443)
Log-Likelihood	-389.503	-499.935	-477.53	-686.41
Rho-squared	0.0767	0.106	0.132	0.088
Chi squared (cv = critical value) Degrees of freedom = 10 for two groups joined and 20 for all three groups joined (alpha = 0.05)	24.7 (cv = 18)	8.73 (cv = 18)	21.9 (cv = 18)	34.8 (cv = 31.4)

* All significant results (alpha = 0.05; $t=1.96$)
 ** significant for (alpha = 0.10; $t=1.65$)
*** Moose and caribou were divided by 1000; Jobs and taxes were divided by 100; and forest age class was multiplied by 100, in all estimations.

Table 5.20 Joint quadratic models between groups.

Variable & Description	Group 1+2 Joint Model (t-stat)	Group 1+3 Joint Model (t-stat)	Group 2+3 Joint Model (t-stat)	Group 1+2+3 Joint Model (t-stat)
Base (Intercept)	0.5332 (1.76)**	0.0646 (0.294)	0.1575 (0.982)	0.2329 (1.145)
Moose*** (Ungulates)	0.3744 (2.984)*	0.5030 (4.96)*	0.254 (3.728)*	0.4440 (4.678)*
Moose squared	-0.0168 (-2.474)*	-0.0228 (-4.301)*	-0.0108 (-2.981)*	-0.0201 (-4.054)*
Caribou*** (Special Species)	5.438 (5.46)*	5.3413 (6.012)*	3.5097 (4.397)*	5.4287 (6.182)*
Caribou squared	-2.6680 (-5.195)*	-2.611 (-5.80)*	-1.702 (-4.262)*	-2.6510 (-5.981)*
Forest Age *** (% Old)	0.07915 (2.794)*	0.04696 (2.269)*	0.04120 (2.219)*	0.05834 (2.878)*
Forest Age Squared	NS	NS	NS	NS
Recreation & Access				
Recreation 1	-0.1609 (-0.870)	0.0309 (0.261)	-0.1261 (-1.248)	-0.0785 (-0.647)
Recreation 2	-0.0762 (-0.435)	-0.1022 (-0.865)	-0.1280 (-1.293)	-0.1211 (-0.992)
Recreation 3	-0.1333 (-0.686)	0.0351 (0.287)	0.1986 (2.011)*	-0.0942 (0.749)
Recreation 4	0.3704	0.0362	0.0555	0.1054
Protected Areas (Above current amount)	0.2227 (2.171)*	0.1769 (2.299)*	0.1295 (2.241)*	0.1898 (2.674)*
Protected Areas Squared	NS	NS	NS	NS
Employment*** (Direct and indirect forestry jobs)	0.0802 (0.818)	0.1601 (2.252)*	0.0676 (1.299)	0.1253 (1.876)**
Employment squared	NS	NS	NS	NS
Tax *** (Changes in household income)	-0.5592 (-2.971)*	-0.4855 (-3.391)*	-0.3676 (-2.978)*	-0.5204 (-3.781)*
Tax Squared	NS	NS	NS	NS
Scale Group 1	1	1	NA	1
Scale Group 2	0.647 (-1.53)	NA	1	0.5925 (-1.973)*
Scale group 3	NA	1.11 (0.586)	1.7407 (2.35)*	0.141 (0.716)
Log-Likelihood	-366.68	-453.52	-413.099	-634.107
Rho-squared	0.131	0.189	0.212	0.157
Chi squared (cv = critical value) Degrees of freedom = 12 for two groups & 24 for all three groups joined (alpha = 0.05)	29.2 (cv = 21)	9.8 (cv = 21)	32.8 (cv = 21)	40.0 (cv = 36.7)

NS = Not significant
 * All significant results (alpha = 0.05; *t=1.96*); ** significant for (alpha = 0.10; *t=1.65*)
*** Scaling as in previous tables

5.5.4 Welfare Considerations

The economic impact of changing these passive-use value attributes is known as welfare measures. In considering the welfare implications of some of the attributes in the above models a movement from the current situation to a plausible future state (e.g. a 5 % increase from the status quo level of the attribute while holding all other attributes constant) is considered below in Tables 5.21 and 5.22.

Table 5.21 Example of welfare impacts for linear models.

Attribute (5% increase from SQ)	Joint Linear CV per person ($CAD)	GP 1 Linear ($CAD)	GP 2 Linear ($CAD)	GP 3 Linear ($CAD)
Moose	11.09	14.74	2.02	13.72
Caribou	3.31	3.48	2.49	3.10
Forest Age	101.56	99.22	150.47	72.88
Protected Area	59.15	73.12	54.25	49.77
Jobs	15.20	23.53	-4.84	17.60

Table 5.22 Example of welfare impacts for quadratic models.

Attribute (5% increase from SQ)	Joint Quadratic CV per person ($CAD)	GP 1 Quad ($CAD)	GP 2 Quad ($CAD)	GP 3 Quad ($CAD)
Moose	10.26	13.64	1.96	14.01
Caribou	12.70	13.64	10.73	25.02
Forest Age	56.05	52.85	121.11	54.13
Protected Area	36.47	38.54	46.36	42.72
Jobs	7.22	10.37	-4.61	11.60

The two different joint models have reasonably similar results for most of the attributes. The joint quadratic model is considered the better model based on the econometric findings versus the joint linear model. In considering moose, for example, an increase in the number of moose from the current population estimate used in the survey of 7500 by 5 % to 7875 would have the average person willing to pay $10.26 in the quadratic model and $11.09 in the linear model in order to maintain the same utility

level. A decrease in the attribute numbers above would require a payment to the individuals in order to maintain the original utility level. These values may be aggregated over a certain population and a more complete economic value used to give some comparison in policy decisions.

The linear models show some interesting difference between the groups. Group 2 is the obvious deviant with extremely low welfare changes from altering moose numbers, very high welfare implication from forest age class and no interest in trading-off any of the other attributes from increased jobs. Group 1 & 3 are reasonably similar in their welfare implications. In the quadratic model, the results have a similar interpretation to the linear models with GP 2 results about the same relative to the other two groups.

In comparing the linear to the quadratic models it may be noted that the welfare impacts from moose numbers are about the same, the caribou impacts are around four times greater in the quadratic model, while the impacts from the rest of the attributes are about twice as large in the linear model compared to the quadratic model.

It can be seen from the above welfare measure that, irrespective of the values, the order of the attributes in economic value are almost the same. In the Joint Linear Model (JLM) the welfare impact from a 5 % increase in the attributes is greatest for forest age, protected areas, jobs, moose and then finally caribou. In the Joint Quadratic Model (JQM) the order is almost the same except jobs and caribou are interchanged. Here, in the best performing model, a 5 % increase in jobs is seen to have the lowest impact on welfare and caribou are in the third position following protected areas.

5.6 Final Group Comments on the PIW Process

5.6.1 Group One

The comments suggested the workshops helped with defining terms and increasing understanding of the survey and the concept of trade-offs. The majority of the respondents did not find the survey difficult to complete and felt the information they received in the workshops was enough, unbiased, adequate to be reasonably certain of their choices. A few individuals, however, pointed out the hypothetical nature of the survey and this made their choices more uncertain. A review of the PIW process by GP 1

suggested the series of PIWs was appropriate, interesting, and worthwhile. See Appendix A for full comments.

5.6.2 Group Two

Group 2 comments suggested the single PIW was enough for this group and a single intense meeting provided enough information, instruction, and time for discussion to be fruitful. There was grave concern over forestry expansion based on technology, old and inadequate inventories. The majority did not find the survey difficult to understand or complete, and felt it had been explained very well before proceeding to its completion. As with GP 1 the information supplied was considered enough to complete the survey. The trade-offs and "forced choices" did leave a few somewhat uncertain with their choices. With respect to bias, a few individuals felt the assumption that a forest can be managed by technology and the species or attributes we choose showed some bias. The review of the PIW process by GP 2 was positive but there were some cynical perspectives when it came to how the results from the process might actually improve land management practices.

Group 3 did not attend any PIWs and thus no comments on this process are available.

6.0 Implications, Conclusions, and Future Research

6.1 Synopsis of Findings and Conclusions

6.1.1 Summary of results

This thesis investigated the PUVs for the NorSask Forest using a preference construction approach to determine if different preference constructing experiences prior to completing a CE would affect the results. It was hypothesized that for different groups a different group variance may be found. The PIW results do show a higher percentage of participants from GP 1 having more certainty in their choices versus GP 2. However, the CE results did not demonstrate this to be the case (possible explanations are considered later in this chapter).

The overall findings from the totality of this research suggest:

PIWs (surveys and comments)

- Environmental benefits and global ecosystem function are deemed priorities above the economic wealth and jobs or even recreation.

- Total harvesting volume, logging practices, and areas allocated to the forest industry (amount) are seen as the most important long-term threats.

- The present and future existence of forest is very important (classic PUV statements suggesting both existence and bequest values).

- Unease with the amount of forest management control over forest resources in the province. This includes concern over environmental degradation and the lack of citizen input into forest management.

- A lack of faith in the sustainable nature of present forest management.

CE Results

- An affinity to the status quo in the face of uncertainty (a well-known fact and an insipid reconfirmation).

- A high value for moose as an important meat source and game hunting species. Indigenous peoples rely heavily on moose for food while the local outfitters rely on moose as an important sport hunting species.

- Caribou (the special species proxy for biodiversity) was of high marginal value albeit subject to a "threshold" where the marginal value decreases once population security is attained (caveat – these decisions are based on the best science available which may be inaccurate).
- An increased utility from retaining more old age-class forest. This attribute had the highest marginal value for each percent increase.
- Protected-areas were another attribute highly valued above the current amount.
- Finally, there was an increase in utility associated with increased employment and a decrease in utility with increased taxes.

The three groups were indeed different and this may be attributed to both recruitment factors and a small group phenomenon. Group 1 was the least critical of present forest management (including a higher percentage of folks feeling present forestry is sustainable), while GP 3 was second and GP 2 distinguished itself as the most critical.

When considering the marginal value for the attributes (from the JQM) the order of importance is as follows: forest age, protected areas, caribou, moose, and finally jobs. These findings are interesting and do have policy implications.

6.1.2 Policy implications

The different values held by a society are not immutable truths fixed in place and time into perpetuity. Values refer to generalized, abstract ideas that are held by individuals or groups about what is desirable, proper, good or bad. Values differ between cultures due to the experience, information or knowledge etched on that culture. Historically, and indeed currently, this myriad of values forming a culture are thought to help ensure a successful perpetuation of that people (i.e. group) during a certain period. Economic values are derived from and are one expression of these larger cultural values. Additionally, these values are based on many different sources of information and thus are dynamic and continually refined via new scientific understanding, technology, and intergenerational progression. As the half-life of scientific knowledge and understanding

(along with the concomitant technology) decreases it becomes incumbent on cultures to adapt with greater rapidity in order to keep pace.

When considering non-timber passive-use values we enter a realm of many possibilities. The mechanical capacity of present technology leads us to ponder the sort of world we will create and ultimately leave future generations; including the type of perturbations and scale of disturbances we wish to place on the landscape. Current forestry policy has the dual objective of targeting older timber stands before they either decay or burn while at the same time promising employment. This research suggests that the public may want a very different set of benefits from their forest including more older age-class forest, more protected areas, and more biodiversity and *not* the incessant push for industry expansion and jobs. It would seem that the public is more risk averse than the present management course and therefore desire greater protected areas and "benchmark" areas to temper the scale of the experiment ongoing to the landbase. Astute policy may move more in this post-modern value direction and away from the extant and moribund industrial models. Moreover, it must be highlighted that the surveyed public in this research was local to a forest dependent community (although many surrounding areas, especially to the south, do support agriculture as well). Wider sampling in Saskatchewan urban areas, other regions in Canada, and international populations would likely produce different (and likely larger) PUVs more in support of these findings.[76]

The comments surrounding employment (Appendix A) and the lack of statistical significance in many of the single group models (Tables 5.17 and 5.18) suggests that employment is not the main driver in the public's mind, albeit the economic good times in which this research was conducted may have changed some perceptions. Politicians and the media often proclaim employment as a paramount issue that may very well be a tautological establishment. This may rather be an urge by government to expand an industry and reduce unemployment, promote economic growth (a standard economic mantra internalized throughout most of mainstream western leadership), prolong their mandate via a "successful" record, increase revenues to maintain social programs, and an

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[76] Certification prices and donations to NGO's to protect forests are an international expression of these PUVs. Many donations and inflated prices are in support of protecting parts of the rainforest throughout the world.

industrial bias due to lobbying and other rent-seeking behavior.[77] In this case, northern Saskatchewan has a rapidly growing First Nations population that experiences a paucity of employment, which may motivate the provincial government to expand forestry.

In this research the majority of the surveyed individuals were gainfully employed.[78] Many felt that the promise of new jobs in forestry was over-rated and linked to ecosystem damage and environmental degradation. The suspicion was in the short-term nature of some jobs (e.g. seasonal, term contracts, construction) and the substitution of capital for labour. A forest left intact gave many participants the comfort of options for the future and subsistence activities in the meantime. Other participants felt that too much of the wealth generated by the forest products was leaking out of the region (to the "south" in the province) and the country (to the United States) thus raising distribution issues.

Considering access and recreation, the models do not produce many statistically significant results. However, examining the quantitative results in concert with the comments and previous ranking and rating exercises it may be stated that easy access was deemed a serious concern. There was a strong consensus in the various groups that too much access was undesirable; on balance the first two levels of access (two and four wheel drive) caused disutility whereas the final two levels of access (ATV and foot) were generally positive. Level three (ATV access) was positive and significant in many cases, which is consistent with the group comments and Mistik's approach; those accessing areas via ATV's are considered legitimate users.

6.1.3   Public involvement process

Involvement in a public process has many aspects in which the individual participant may find interest and gratification. Participants may be motivated and rewarded by the process itself or they may be more interested in the end results of their input. For many in industry, government, and the public, the PI *process* itself is enough in that it provides the public with an opportunity to exchange information between

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[77] Governments also have objectives which may result in inefficient outcomes i.e. Government failure.
[78] Although comments from those unemployed or under-employed were more in favour of an intact forest that allowed more traditional means for subsistence. Others felt an intact the forest provided future options.

themselves and industry, social learning, exercising democracy (empowerment), community vigilance and engagement. Therefore, beyond the results, a PI process has a very important social function and role in community well being. A perusal of PIW group comments (Appendix A) is convincing of this point and it is clear that beyond any quantitative results the process itself had tremendous social value. The PIW process unequivocally engendered: trust, education, interest, and successfully interfaced with the public while allowing a legitimate format to raise concerns.

In this research the results are fairly similar from all three groups and the initial working hypothesis of reducing group variance in choices was not realized. This may be explained in a number of ways. First, the initial group may have been very successful in assisting with survey design: clarifying terms, descriptions, concepts and presentation. This careful design phase may have greatly reduced or even eliminated the inadvertent obfuscation, nuance, special knowledge and experience sometimes necessary to successfully complete a survey (obviate the need for preference construction). Assuming this result, the promise for successfully aligning the respondents' true preferences in the survey may have been realized. Second, the recruitment of individuals motivated enough to participate in a PIW and those referred for the mail survey were predominantly individuals that held stable and well-defined preferences prior to the survey. This argument holds credence in that some individuals stated (Appendix A) they have had similar conversations in the past, which would have helped to delineate their position and understanding of these more complex issues. This may represent a sampling problem and a more random technique devoid of the self-selection or referral component may produce different results. Therefore, the notion of demonstrating variance differences between groups may have been hampered *but* the information gleaned from the individuals during this research will likely have been superior due to the profundity of their inquiry. The small sample phenomena may result in certain groups being peculiar; GP 2 was different than the other two groups in many ways. Group 2 was the smallest group, had a slightly different demographic (more women, lowest income and highest natural resource dependence), provided the highest response rate of all groups and had very different CE and welfare measures. Finally, the vagaries in preferences may not be as postulated (e.g. linear from a relatively low certitude to higher certitude following exposure to

information) but rather take a more U-shaped course (Figure 6.1). This may explain how different groups with different survey experiences may map to similar locations in choice certitude (and by extension variance). When in fact, one group may have taken a very different course in order to arrived there.

Possible preference construction experience

——— Low to high certitude ▬ ▬ High-low-high certitude
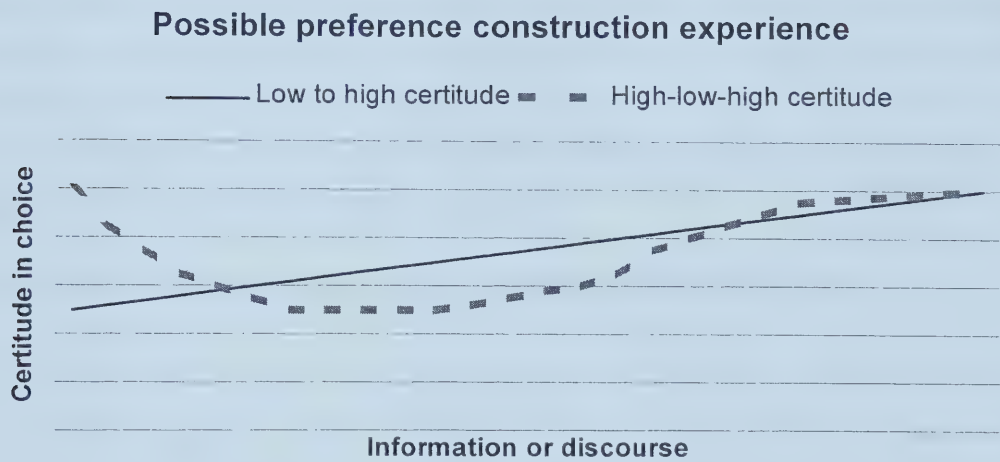
Figure 6.1 Possible response to information and discourse on individual choice certitude (variance).

It has been empirically demonstrated that "ignorance is bliss"; individuals that are the least aware hold a grossly overestimated view of their own abilities (Kruger and Dunning, 1999). This condition holds the 'dual burden' of not only arriving at erroneous conclusions but also lacking the metacognition[79] to realize it. In contrast, those who improve these skills of decision and metacognition are more aware of their limitations and more uncertain with choices. This may enter into choice certainty and decision-making in CE's and provides some insight into the optimal time frame for preference construction considering that time is a scarce resource. Considering this information and the comments provided it appears that a single meeting might be optimal for preference

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[79] Metacognition generally defined as including one or more of the following: active monitoring, conscious control, or executive regulation of mental processes (i.e. "thinking about thinking") which determines how a person can and will learn.

construction, community empowerment and high response rate in the results. Survey design however, still relies on a qualitative phase that is beneficial as PI in its own right.

Despite the results, which were informative and insightful, it is argued here that the PIW process used is superior to the usual perfunctory mechanisms (e.g. open houses) or public advisory groups (which often undergo a secondary socialization which renders them unrepresentative of the public) of PI often employed by industry. This PIW format truly engages the public in meaningful PI that challenges them to understand and comment on very complex issues. Both the company and the public will realize higher dividends in this process as the comments in Appendix A testify. As postulated at the outset, those individuals not involved in the PIW, GP 3, did manifest greater protest (by higher numbers of SQ and non-response surveys).

6.2 Future Research and Areas for Greater Understanding

In the quest to model human choice behavior more accurately a few parallel areas of research may assist the process. Eliciting accurate landscape preferences from current individuals will take many years to achieve and evolve, however, there must be some progress in how possible scenarios are displayed and conveyed. This particular research relied on written and verbal descriptions for the different possible states or 'futures' based on a limited number of attributes. This may have been adequate for some individuals that possess greater literary and abstract thinking skills but a future improvement may come from ecosystem models and GIS information displaying different dynamic (spatial and temporal) scenarios. This technology holds the promise of aesthetics, wildlife populations, watershed quality, weather projections, etc., all being predicted under different management optimization scenarios that may then be rated by the individuals in a society.[80] This type of simulation would reduce the information lost on individuals with literary deficits and also cater to the highly visual nature of the human brain in preference selection.

Public involvement in decision-making is not likely to diminish as information and education is more widely disseminated throughout the world via the internet

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[80] This type of simulation could ultimately be extended to Virtual Reality in which individuals could "experience" all aspects of a proposed future state and evaluate it based on that level of intimacy.

(Tweeten and Zulauf, 1999). In general, the progression from patriarchy (male dominated) to modernity (atomistic, reductionist, and isolationist) to post-modernity (holistic, emergentist, contectivist and system oriented) only magnifies the urge to seek harmony with all systems in a more holistic manner and this bodes well for greater environmental concern among the citizenry (Blatz, 1999). The question related to valuation may be whether national borders continue to be perforated and hence valuation exercises broadened to international audiences, who, in a global economy, directly affect environmental conditions around the world.[81]

Endogenizing preferences is the ultimate goal of economic choice modelling. If preferences could be endogenized then they would be solved by the model (i.e. a model of preference evolution) as opposed to being brought to the model exogenously and subsequently maximized. This would also work to integrate preferences and the landscape features more effectively (i.e. preferences known antecedently versus ex post) and thus maximize social value. It is uncertain whether economic valuation will retain the neo-classical framework or evolve to a more community-based post-modern valuation method which might hybridize the positive and normative analysis (i.e. less based on individual values preferences and utility). This trend is possible as environmental concerns and post-modernity notions sweep through most developed countries (Tweeten et al., 1999). Economists have remained largely in the modernist perspective applying neoclassical tenets and positivism. This stands to obstruct interdisciplinary work and leave the modern scientific worldview incapable of addressing adequately many seminal issues of the day (Tweeten et al., 1999).

The parochial nature of many fields of research is being reduced by interdisciplinary research agendas. The hermeneutical nature of all knowledge is a challenge to landscape planning as different groups utilize specific analytical paradigms to interpret an issue in a way that correlates with their embedded values, interests and approaches.[82] Thus, bridging disciplines should aid in mitigating landscape management conflicts and predicting outcomes and interrelationships from different perturbations

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[81] Forest use values derived mostly by the local populations balanced against the passive-use values that are enjoyed more by the international community.
[82] Examples of this are rife, as differences between the public and professional foresters are well documented (Wagner et al, 1998).

(either anthropogenic or natural). Additionally, integrating human behavior into biological models is required to understand the full implications of our activity in an ecosystem context.

Another area of research is in how preferences and choice certitude may change over time while being subjected to preference constructing information and activities. It is known that preferences for complicated or abstract values are often constructed in-situ. The results of this research have raised the notion that preferences and choice certitude may not follow the course speculated in the initial hypothesis (e.g. starting with low certitude and higher variance and finishing with higher certitude and with lower variance). Choice certitude may rather start high (or relatively high) and then fall based on increased information and dissenting discourse from various sources (as Figure 6.1 illustrates). This assertion needs to be formally tested empirically. In any event, preference construction and the underlying psychology is likely more complicated than presently understood.

Environmental values, science, nature and human beings will all continue to evolve over time. Our science and technology concomitantly generates new problems while solving older ones. Public involvement currently plays a significant role in sustainability and social risk assessment. These social choice issues are not likely to subside for a very long time and thus PI is expected to persist and evolve well into the future. Human problems require human solutions and the best way to understand our world, and ourselves is to continue to probe our limits as a species in all fields of social and scientific research. It is imperative that governments, land mangers, and academics embrace this journey in order to develop better land management methods and foster better relations between disparate groups within society. The economic tradition of considering these types of issues, trade-offs and allocations will also need to develop new techniques and interdisciplinary methodologies to meet the future challenges.

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Appendix A – Group Comments

GROUP I

Group #1 Pre-PIW Survey

These comments were collected following the questions below:
Do you believe forest management in Saskatchewan is sustainable? Why or why not?

Believe sustainable

> Replanting is taking place and long term management is reasonable for most involved.
> Yes, if we keep harvesting 10% of available timber each year we can keep a sustainable forest and we are not at 10% annually yet.

Dissenting opinions

> Pace of harvesting exceeds rate of reforestation.
> In cleared areas no regard is being given to the depletion of nutrients caused by the wood being removed versus returned to the soil.
> No, especially considering the recent target to double forest exploitation. Regeneration is grossly over-estimated and that the environmental impacts are not fully understood and/or acknowledged.
> Not enough research has been completed on implications of management practices. Similar to PCB issue, do it first (logging) till negative effects appear, then try and fix problem.

Do you have any other values or sentiments toward the boreal forest in NW Saskatchewan?

Environmental concerns

> I enjoy the recreation provided by the forest. I feel is very important that areas of the forest - old growth and younger forest be set aside and protected from logging. However logging is important to the economy of Saskatchewan. If managed properly it is certain that it can continue without jeopardizing the recreation value of the forest. The economic benefits to Saskatchewan when harvested and managed properly. It is important for all user groups to discuss management of forests.
> Maintain the native look to the forest and eliminate the "waste".
> I see it as a crucial element of our eco-system. I accept elements of multi-use if balanced with selected areas of permanent preservation.

> Natural beauty, relaxing, food & gathering, heating, clean air and water, healthy ecosystem, wildlife.

Sacred or spiritual values

> I've become a part of this forest. I know and love this forest.
> The beauty and lakes are irreplaceable.

Future generations

> We have to manage our forest for the long run (i.e. 100 years), but we should harvest with control in cut over sizes and age of the trees, as old trees will die.

General

> I appreciate the fresh air, wind protection, and quiet. But, I also know the necessity for using my surroundings for food, shelter, and warmth.
> The abundance, health, and diversity of wildlife in the forest.
> I think I am lucky to live near so many Parks and lakes.

Do you have any other comments or concerns about forest management in Saskatchewan?

Environmental concerns:

> One of the major problems that logging has caused in our area is not the removal of trees but the access to sensitive areas. When these areas are logged access should be totally denied (whatever it takes).
> Issuing licenses *before* environmental and management plans are approved is akin to closing the barn door after the horse is gone. It taints the subsequent consultation processes.
> I believe the forests need to be protected. I worry with the increase in logging in NW Saskatchewan that there will not be enough future forest. I'm not convinced forest management is effective.
> Management should provide detailed habitat requirements of the wildlife that may be affected by development and manage to minimize as well as enhance present habitat.

Group # 1 Workshop # 3 Survey Comments

This iteration of the survey offered seven attributes (of these, six were explicitly discussed by the group in previous workshops (i.e. Moose, Special Species, Forest Age Class, Recreation Restrictions or Access, Household Income Tax Change, and Employment). The seventh attribute was implicitly discussed and now offered as a 'Forest Management Approach', which considered the 'Triad' of forest management. The three parts of the triad consist of Intensive, Extensive, and Set Aside areas in differing proportions. This proved too complex and abstract for the majority of the group and was replaced in the future iteration with the more simple 'Protected Area' attribute.

Additional comments following survey completion (16 respondents):

Reaction to Survey

> Found the survey confusing that the changes to the different options didn't logically affect each other. I found the discussions much more interesting.

Future generations

> Future generations have to have more jobs in eco-tourism and enjoy the outdoors and there is going to be a lot of them. More emphasis on game farms in the future. Less recreation access (i.e. more level 4) for recreation.

Environmental concerns

> In wildlife resource allocation conservation is the first on the hierarchy ladder, whereas for the forester it would be timber supply of public satisfaction and not conservation of species.

Equity

> First Nations people also view resources as being their "property" and feel the government should negotiate (consultation) management and revenue sharing (compensation) with them.

Access

> My decision was influenced by one attribute as a priority to keep man-made disturbances to a minimum (Foot Access) but I gave in to the amount of moose.
> Access should be restricted. ATV for a half day in hunting season. No access on any road that has been closed off due to no timber harvesting being done in the area.

These comments and a discussion following the survey resulted in the final survey being a correlated design.

Group #1 Final (Mail) Survey Comments

Table A1. Group 1 response to the survey difficulty - *Did you find the survey difficult?*

Group	Number of Respondents	Not difficult to complete survey	Somewhat difficult to complete survey	Difficult to complete survey
1	14	10 (71%)	3 (21%)	1 (7%)

Comments:

- 'Easy to do without much thought to reality'
- 'It was an eye-opener'.
- The concept of forcing choices was clear.
- The discussions at the workshops made the terms clear and the survey easier to understand.
- I found it difficult, only because the decisions are difficult to make regarding the consequences.
- Not difficult but 'perplexing' with some of the attributes moving different than expected.

Table A2. Group 1 response to survey clarity* - *Were there any parts you found difficult to understand?*

Group	Number of Respondents	Answered "No" or not difficult to understand survey	Answered "Yes" or difficult to understand survey
1	13	11 (85%)	2 (15%)

* Note: This survey followed a previous survey that followed the same format; therefore a de facto 'warm-up' survey preceded this one.

Comments:

- The vocabulary was challenging.

How certain were you in your choices? Do you feel you had enough information to make the choices?

Comments:

➢ "Felt like I could live with one or another"
➢ 'The information supplied was adequate, but it is difficult to make decisions based on a hypothetical situation.
➢ I tried to choose the option with the best balance but was willing to make small compromises.

Table A3. Group 1 response to information presented. *Do you think our presented information or questions asked in the survey showed bias?*

Group	Number of respondents	Answered "Biased"	Answered "Not Biased"	Unsure
1	14	1*	12	1

* The bias identified by one individual was in the selection of species used in the attributes.

Comments:

➢ Information was good.
➢ 'No, especially now that I understand more about the survey.'

Table A4. Group 1 response to workshop and survey process - *Do you think this series of workshops for public involvement was appropriate? Interesting? Worthwhile?*

Group	Number of respondents	Appropriate		Interesting		Worthwhile	
		Yes	No	Yes	No	Yes	No
1	14	5	0	10	1	10	1

Comments:

➢ Acquiring a better understanding of the publics concerns.
➢ The workshops were informative and give the average person input.
➢ Anything to broaden awareness and understanding is worthwhile.
➢ Interesting and worthwhile – whether appropriate or not will depend on the end practice.
➢ I learned a lot from the workshops.
➢ Not overly interesting but worthwhile, how else can the forest companies make decisions that are going to change the landscape. This provides forest companies with information on how to least offend the public with cutting plans.
➢ I found the sessions very interesting…and worthwhile (even stimulating further reading). I felt honored that as a member of the public my opinion was asked for.

Additional Group 1 General Comments:

Comments on Forest Management

➢ "Forester taught to look for trees for value" and feeling that the majority will ultimately decide so a false sense that your opinion is valued.
➢ History demonstrates that commercialism usually dominates over legitimate environmental concerns. Balance thus becomes difficult.
➢ I was concerned that we are trying to manage the forest for "ALL" people. The note that there would be no change for aboriginals, does this include Quad use, 4WD's, ski-doos, not being traditional!
➢ Waste is an expression of inefficiency.

Comments on Survey

➢ Presentations are more understandable than surveys – more people from the northwest should be involved in these workshops.
➢ The workshops are required in order to understand the survey.
➢ Survey may establish a better understanding and negotiation of priorities for future generations.
➢ Workshops made the survey clearer. It is difficult to make trade-offs in a hypothetical situation. In real-life, one's priorities may be different.
➢ I think even a one day (one time) workshop would be helpful, if there are any questions, they could be answered before the survey is started. The choices in the second (correlated survey) survey were easier to make.

Group 1 Additional Comments

These comments were mailed in to the researchers following the last meeting. An invitation to submit any further comments of concerns was extended to all the participants.

➢ One individual was concerned that the expansion in the forest industry was too rapid and that not enough was known about the long-term environmental effects and sustainability. Further concerns were the over-emphasis on jobs and economic growth. The respondent believed more protected areas and natural reserve land needs to be established. The final comments stated that PI and workshops such as these are important in order to involve people and increase awareness about the forest industry. Given these changes there may be hope for the future and preservation of the resources.
➢ A second letter was sent that expressed feelings of appreciation and privilege for the opportunity to participate in a public involvement process. The individual stated the initial impetus for participating rested in concerns over harvesting methods and environmental ramifications but developed into a wider learning experience and has stimulated further reading and awareness.

GROUP II

Group #2 Pre-PIW Survey

Do you believe forest management in Saskatchewan is sustainable? Why or why not?

Believe sustainable

➢ Forest management may be sustainable if harvesting is selective and limited. Hopefully greed doesn't take over our forests.

Dissenting Opinion

➢ There is doubt now that forest management is sustainable and when the new increases come about, along with climate change and increase pressures from population growth it is even more unlikely.   There also needs to be EIA (environmental impact assessment) and Land Use Plan before the increase will happen which gives a bit more hope that it will be managed in a more sustainable fashion.
➢ Not sustainable because harvesting technology is growing faster than the forest – hence harvesting too much too fast.
➢ No. Reforestation is not keeping pace with cutting rates. Clear-cutting destroys the nature of the new forest.
➢ Not sustainable. In something like a decade there will not be enough prime timber to feed the mills what they now consume. Reforestation efforts are not enough with poor performance and inadequate planting and site selection.
➢ No – and the result will not sustain the wildlife.
➢ Replanting trees is too slow.
➢ No, especially after the government indicated recently that they want a doubling of the amount of wood to be taken. The forest will not regenerate enough to ensure an adequate wood supply.

Do you have any other values or sentiments toward the boreal forest in NW Saskatchewan?

Sacred or spiritual values

➢ I was instilled with a love of the forest and enjoy the plants, birds, & animals of the forest. I have chosen to live in the forested area for its beauty and abundance. I have found employment, peace, and revival in the forest. It supplies us with fresh air, food, & shelter and is a great heritage that must be preserved for future generations.
➢ This is my home. I was born and raised here and I make my living trapping and commercial fishing.

- The forests and lakes have been a great source of recreation. It has been a treasure.
- The boreal forest sustains me both spiritually and economically. I am aware of gross waste and mismanagement of the Saskatchewan boreal forest. The haphazard approach to ecology in this province is dangerous and shortsighted. We need regulations to ensure the "little accidents" (e.g. oil spills, trespasses) and failures (e.g. clear-cuts not being adequately restocked for numerous reasons) do not results in irreplaceable damage to our boreal forest. Our "disruption" forest is, I believe, very well suited to careful harvesting. This means real, ecologically based management.
- I believe the forests are integral to the well being of the planet. If forestry 'management' practice is used for the sole purpose of profit (industry or government) then this is contributing to global warming and locally to ecosystem destruction. 'Management' or 'Managed' forested do not necessarily lead to sustainability. This is a moral issue and not just an economic one.

Environmental concerns

- There have been many lessons learned about forestry practices from other countries that have been logging much longer than us, hopefully we can learn from them and not make the same mistakes. We need to realize we have a very precious resource not to be put at risk but preserved.
- Often 'experts' in the forest industry base practices on other jurisdictions and this proves dangerous to the environment. Practices that follow bigger are better, care more for now than sustainability. Ideas that if man cannot make money from it only destroy it or waste it and hurt everyone.

Future generations

- Hopefully our leaders have the wisdom to keep our forests for future generations.
- Very important to maintain our forest for future use for both human and animals.

Additional Comments:

Management Issues

- I feel there is little left to manage in the forest as all rights have been surrendered to the forest industries or companies – their contracts leave little to decide by outsiders.
- Too much American control of our natural resources.
- Local and First Nations working together to manage the forest for more than timber and profit.

Future generations

➢ I am very concerned about the amount of trees being harvested in our forests. I think our present government is more interested in the economic area rather than what will happen to the forest for future use.

➢ I would like to believe that concerns brought up in the discussion would be reflected in the actual practice of forest logging. However, experience dealing with consultative meetings, have shown this to be incorrect. My meetings with SERM often were simply smoke and mirrors.

Group #2 Final Survey Comments

Table A5. Group 2 response to the survey difficulty - *Did you find the survey difficult?*

Group	Number of Respondents	Not difficult to complete survey	Somewhat difficult to complete survey	Difficult to complete survey
2	12	8 (67%)	2 (17%)	1 (8%)

Comments:

➢ Most choices were easily answered.
➢ The trade-offs often did not coincide with what I would prefer. Sometimes compromise is not proper or the right answer.
➢ Some choices aren't realistic but rather hypothetical.
➢ Not difficult. It was well introduced and I've debated similar issues before.
➢ We have to pay a bit more to have a healthy forest and wildlife.
➢ No, it was explained well before we started to fill it out.
➢ No, choices were clear for each task.
➢ No – although initially confusing, I found I could choose the scenario satisfying my agenda easily.
➢ Trade-offs are difficult and there's nothing that can be done to please everyone.

Table A6. Group 2 responses to survey clarity - *Where there any parts you found difficult to understand?*

Group	Number of Respondents	Answered "No" or not difficult to understand survey	Answered "Yes" or difficult to understand survey
2	8	7 (88%)	1 (12.5%)

Comments:

➢ Some parts were a little difficult to understand.

Table A7. Group 2 certainty with choices - *How certain were you in your choices? Do you feel you had enough information to make the choices?*

GP	Number of respondents	Reasonably certain with choices	Uncertain with choices	Enough information	Not enough information
2	12	5	4	4	0

Comments:

➢ Rather short time frame to complete - could do a better job if we had more time to considered.
➢ A little uncertain as to what some of these attributes actually meant to the overall effects on the forest.
➢ Some of the choices were not too sure.
➢ I had to choose the least desirable in some. These were forced choices that included a number of things I did not want.
➢ I simply chose low access, 'old growth' preservation, and protected areas either maintained or increased.

Table A8. Group 2 responses to information presented. *Do you think our presented information or questions asked in the survey showed bias?*

Group	Number of respondents	Answered "Biased"	Answered "Not Biased"	Unsure
2	10	4	4	1

Comments:

Believed Bias

➢ The bias I see is the belief that nature can be managed and problems or the forest can be saved by technology. *Some* areas should be left alone.
➢ Yes, bias but how could you avoid it? The bias is in the seven attributes chosen for your survey instead of the many other uses/attributes that could be used.
➢ A little bias to having technology as a way to improve our management or treatment of the forest - it's not the only way.
➢ Bias in abstracting the forest more, instead of treating our serious discrepancy between "plan" and action.

Believed No Bias

➢ No – not at all.

Additional General Comments:

Comments on Survey and Process

> I would like to believe that concerns brought up in the discussion would be reflected in the actual practice of forest logging. However, experience dealing with consultative meetings, have shown this to be incorrect. My meetings with SERM often were simply smoke and mirrors.
> This small group meeting is a good idea. I would like to see small areas left for old trees to grow.
> I think the public involvement process is the best way to find out what the tax paying people are thinking about.
> The logging companies have to find a way to keep the most forest and wilderness.
> I'm grateful to have had an opportunity to participate in your study; I am not at all sure it will be of much use. Individual agendas should take a backseat to ecological concerns.
> There were very good discussions around the table. We would like to see more public involvement in these kinds of meetings.
> This is a good format and the process has value to help with forming public policy.

GROUP III

Group #3   Final Survey Comments

Do you believe forest management in Saskatchewan is sustainable? Why or why not?

Believe sustainable

> Yes, but only if the planners consider all the people and animal communities.
> I think it could be if proper care and planning is made for harvesting and economic development.
> Yes, provided local input is sought and local ideas and knowledge is built into forest management practices by the forestry sector and/or industry.
> As long as man replants the trees harvested for "jobs" and can do it with minimal damage to the surrounding ecosystem – then yes.
> Yes, more timber is burned in Saskatchewan every year than is utilized. Forest use increases access for recreational uses as well as fire control and access for reforestation.

Uncertain

> Cannot comment without data or expertise.

Dissenting opinions

- Cutting is exceeding the rate of planting and regrowth, which is very slow.
- No, at the present and increased rate of cutting and the years needed for regrowth it will not be possible without totally damaging the environment.
- No, 'sustainable' is a subjective term and can only be determined in the long-term experience. In my opinion present forest management is about economics (industry and government) and any time money is involved sustainability and other nebulous terms such as aesthetics, protection of wildlife and habitat will be a secondary consideration.
- No, recent government announcement about major increase in harvesting forest products based on 20-30 year old inventory surveys. Politics takes precedence over common sense.
- I believe companies are putting a good effort forth to manage sustainable. I think the government is too aggressive in allocating timber and calculating the AAC (Annual Allowable Cut), which is not sustainable.
- The clearcut areas are bigger than we expected and that makes us nervous. Their tree planting is good.
- No, the forest is not replaced or grows too slowly to sustain the forest industry. Many young trees are destroyed in the process.
- I believe forestry in NW Saskatchewan is getting too high. More importance should be put on wildlife and habitat and less on making money.
- No. There are more user groups demanding a share of the forest. Reforestation is a very low priority while using as much as we can in a short period is winning.
- No. Clearcutting destroys more than can ever be replaced by replanting. Replanting only replaces a portion of what is taken and only replaces what logging can harvest in the future – what about what is destroyed: plants, berries, medicines.

Do you have any other values or sentiments toward the boreal forest in NW Saskatchewan?

Spiritual and Sacred Values

- A place to allow Nature into the hearts of people to allow for healing and appreciation.
- The boreal forest is nesting area for numerous birds and a home for many species of animals. This is more important to me than the harvesting of pulpwood.
- The boreal forest contains many sacred, beautiful, and special places in it.
- I can't imagine life here without the forest – not only is it needed for wildlife and plant life to balance out the ecosystem – it is needed to balance the mind and spirit for man – and yes, it provides jobs not just timber but recreational use.

Environmental Concerns

- All stream, rivers, and lakes should never be allowed to be polluted.
- I am concerned with the vast tracts of land that are clear-cut in the sandy soils that make up a lot of the cutting areas. It takes tens of years for the replanted areas to grow to usable land again.
- We spend a lot of time in the forests of Saskatchewan and see a lot of wastage of usable forest products. While economics make recovery of smaller amounts not practical everyone should make more effort.
- Logging affects not only the amount of tree types and plants or animal levels but it also affects weather patterns (wind, rain) and water levels.

Future Generations

- I believe we should treat it all with great caution – as it's our children's future.
- Fear for future generations.

Additional comments about the survey or the public involvement process:

Spiritual and Sacred Values

- The boreal forest is the greatest attribute in NW Saskatchewan. Managed and used as a balance it will always survive. Take away the balance with Nature and we end up with the 'leftovers' of the major forest players for profit people. Money should not be the issue, balance and appreciation is more important.

Environmental Concerns

- I strongly disagree with clearcutting and mechanical logging. A forest cannot rejuvenate when everything is destroyed and replanted. A sensitive balance between economic needs of northern Saskatchewan people and the maintenance of our forest heritage needs to be maintained. Economics cannot drive the whole system. I would rather be able to continue to live off the land and enjoy the bush than make some southern logger or mill owner rich. The economic benefits really don't reach Northern people to any great extent. Poplar trees are not "weeds" – they are part of our natural forest and serve an important function.
- The clearcutting may eventually lead to growth and favorable habitat for moose and deer; it does not address the population decline due to habitat lost directly following harvesting. Also increasing access to the areas leads to increased unrestricted hunting pressures. The damage from clearcutting to the environment includes clearcutting up to the lakeshores, soil erosion, and lack of regrowth and decimation of moose populations.

Future Generations

➢ My concern is that the harvesting methods of the timber are the main focus of the government and the timber companies. Not enough respect is given to the wildlife, the beauty of the areas and leaving a place for future generations to enjoy. It is reasonable to provide jobs for local people but because of the large equipment there is less need for individual workers.

Comments on Survey

➢ This was an interesting survey – it made me think about the forest and the impact on so many different "level" or "attributes". I tried myself not to put too much emphasis on jobs – since to me I think that more importance lies with the animal survival and protection of the forest. I look forward to the result s of this survey. Thank-you.
➢ The logging industry should pay much more to repair the major highways, which are damaged by the logging trucks.

Overall Group Comparisons

Table A9. Group responses to the survey difficulty - *Did you find the survey difficult? Why or Why not?*

Group	Number of Respondents	Not difficult to complete survey	Somewhat difficult to complete survey	Difficult to complete survey
1	14	10 (71%)	3 (21%)	1 (7%)
2	12	8 (67%)	2 (17%)	1 (8%)
3*	NA	NA	NA	NA
Totals	26	18 (69%)	5 (19%)	2 (8%)

* Not Applicable

Table A10. Group responses to survey clarity* - *Were there any parts you found difficult to understand?*

Group	Number of Respondents	Answered "No" or not difficult to understand survey	Answered "Yes" or difficult to understand survey
1	13	11 (85%)	2 (15%)
2	8	7 (88%)	1 (12.5%)
3	NA	NA	NA
Total	21	18 (86%)	3 (14%)

* Note: This survey followed a previous survey that followed the same format; therefore a de facto 'warm-up' survey preceded this one.

Table A11. Group responses to information presented. *Do you think our presented information or questions asked in the survey showed bias?*

Group	Number of respondents	Answered "Biased"	Answered "Not Biased"	Unsure
1	14	1*	12	1
2	10	4	4	1
3	NA			
Totals	24	5 (21%)	16 (67%)	2 (8%)

* *The bias identified by one individual was in the selection of species used in the attributes.*
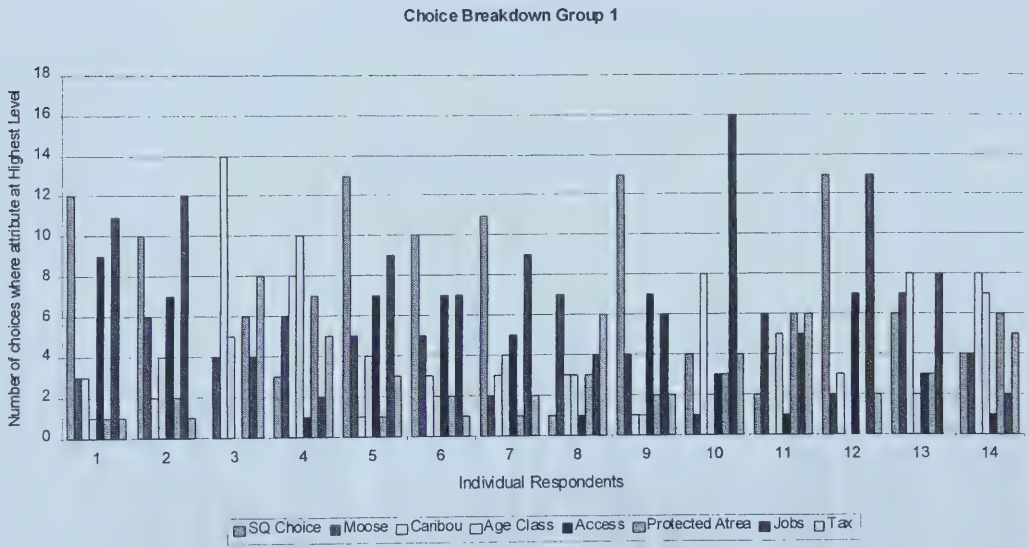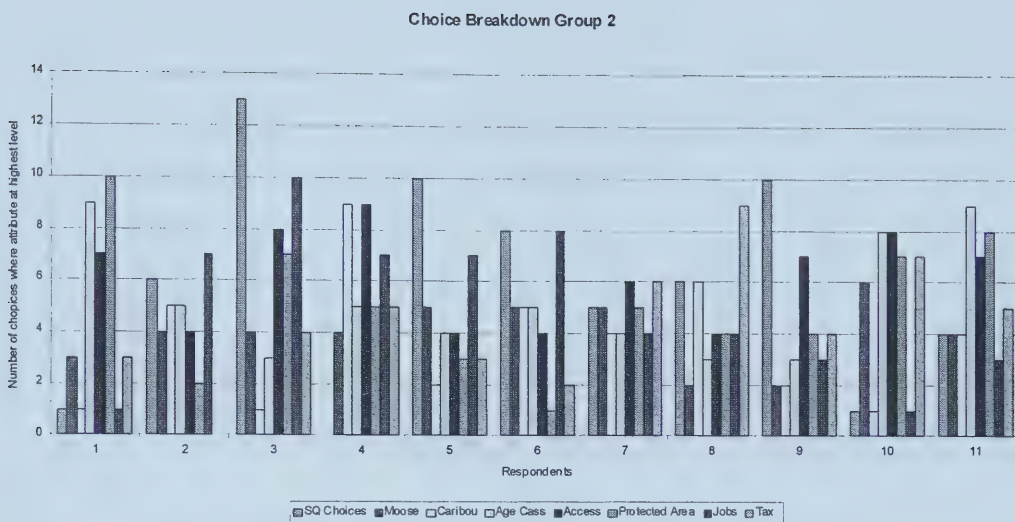*NA – Not Applicable.*

Choice Breakdown Group 1

Figure A1 Group 1 CE choices

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Choice Breakdown Group 2

Figure A2 Group 2 CE choices

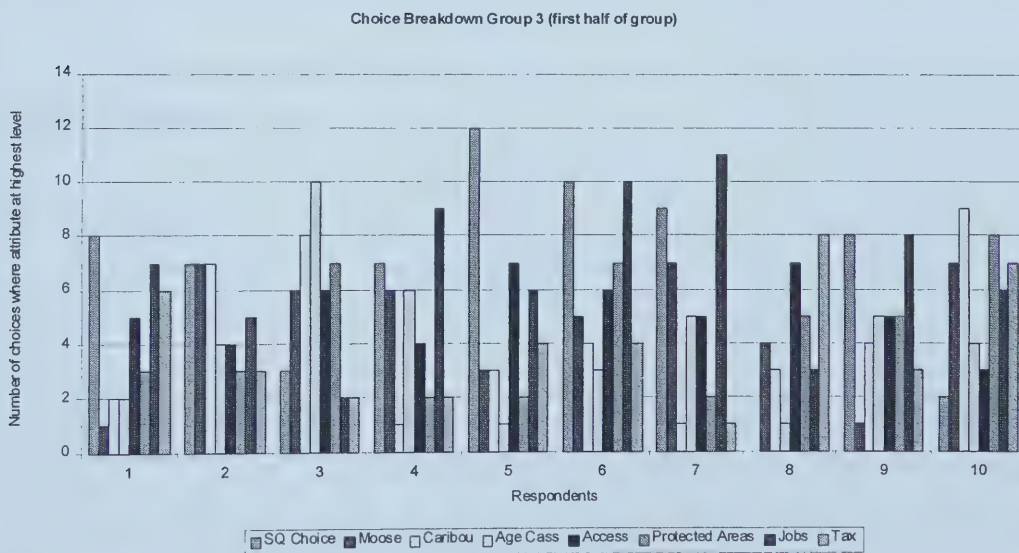Choice Breakdown Group 3 (first half of group)

Figure A3 Group 3 CE choices
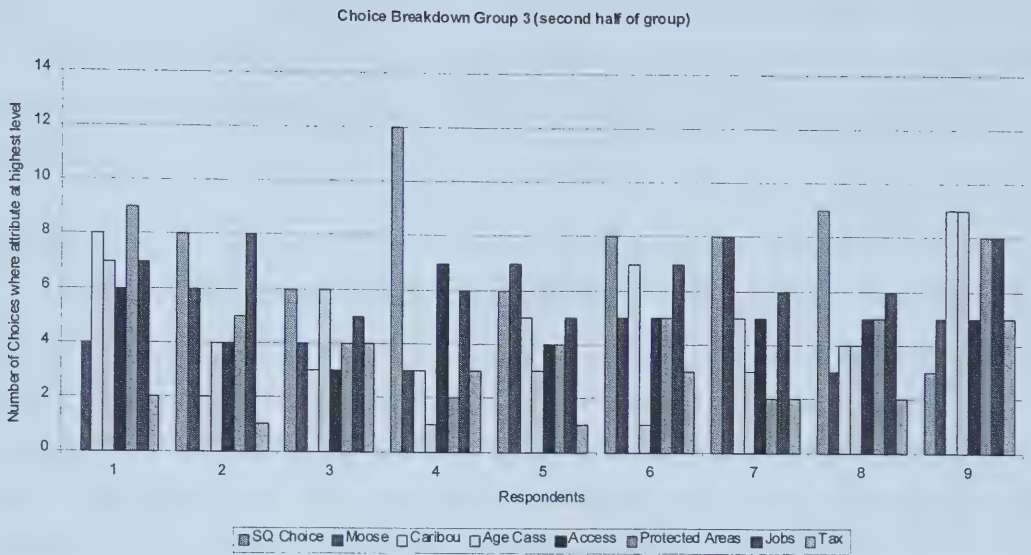
Figure A4 Group 3 CE choices continued

Choice Patterns

Group 1

In Figure 5.3 the choice pattern for each individual in GP 1 are displayed. Each individual survey and choice task was inspected for the number of times a given attribute was at the highest level in the selected choice. For example, respondent number ten was the individual demonstrating lexicographic preferences for jobs. Therefore, the number of times jobs were at the highest level in all choices was sixteen times (i.e., in every case). Other attributes that appear somewhat high, for example caribou, are only high as coincidence through survey design and not due to direct selection.

In looking at these choices, half of the respondents (numbers 4,6,7,8,11,13, and 14) had a balanced approach to making their choices and trade-offs. Respondent number three made no SQ choices and focused largely on the caribou (special species) attribute. Respondent ten was lexicographic in selection for the jobs attribute. The remaining four respondents (numbers 1,2,5, and 12) chose a high number of SQ choices and high levels of jobs. Two notable respondents are twelve and thirteen. Respondent twelve, beyond

selecting for mostly SQ and high job choices, avoided selecting the highest level for old age class or protected area in any choice (relative to the other choices). Respondent thirteen manifests a balanced approach but also avoided selecting taxes at a high level in any choice.

Group 2

The selection pattern for GP 2 in Figure 5.3 is fairly balanced. However, some patterns do emerge. Respondents 2,7, and 8 are very balanced in their choices and yet number two completely avoided selecting the highest tax level in any choice. Respondents 1, 10, and 11 selected for high levels of old age class forest and protected areas. Respondent four had high levels for caribou and access. Of the four, three (numbers 3,4, and 6) had high levels for SQ and jobs (notably number 4 had no SQ choices) and one respondent (number 9) had high numbers for SQ and access. No one in this group manifests lexicographic preferences.

Group 3

The final group (Figures 5.4 contains the first half of the group and 5.5 the second half) also shows fairly balanced choices overall. About half the respondents (Figure 5.4 numbers 1,2,4, and 8 and in 5.5 numbers 1,2,3,5,6, and 7) have balanced choices. Interesting exceptions are respondents 5.4 number three that chose high levels of old age class and 5.4 number ten who selected choices with high caribou and protected areas. Number five of figure 5.4, chose a high number of SQ responses and the remaining numbers of 5.4 (6,7, and 9) are all high in SQ responses and jobs. Exceptions in figure 5.5 are number nine, who selected for higher levels of caribou and old age classes. Numbers four and ten of 5.5 selected a high number of SQ choices in addition to high access and old age classes respectively.

Overall Choices

The choice pattern of the three groups seems fairly similar according to this choice breakdown approach. Roughly half the respondents in each group appear to make fairly balanced choices recognizing the trade-offs in the process. Two other strategies or

agendas seem to emerge: one is to select a high number of SQ choices and a high number of jobs, the other approach is to have an environmental and protection position which is more apt to select change and discounts the tax and job consequences.

NorSask Forest Survey

Considering the Options

The purpose of this research is to consult the public regarding their land management preferences in the Norsask Forest (Public land).   Both the Saskatchewan government and forest industry are interested in attaining sustainability. Public input is a vital component to achieving sustainability by providing information to manage the forest for a wide range of values. This information is required to manage the forests in a way acceptable to the public.

Thank-you for taking the time to complete this questionnaire. Please try to answer all of the questions.

All information you provide is strictly confidential. Your name will never appear with your answers. Only a summary of the results will be publicized.

Please return your completed questionnaire in the postage paid envelope provided.

Thank-you and we appreciate your help with this project.

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Part I - Forest Management Opinions and Beliefs

There are no right or wrong answers to these questions; rather we need your considered response to each question. Please feel free to comment on any question that you feel deserves additional attention. Use the additional space on the back of the survey or attach your own notes, for any such comments.

Please try to answer all of the questions. If there are any questions you do not wish to answer, please omit them and move on to the next question.

Section I

Your opinions on Forest management in Saskatchewan

*(1) Please **rank** the following choices in relation to forests in Saskatchewan from "1" for most important to "6" being least important (**NOTE: Do not use a number more than once**).*

a) For wilderness preservation
b) Environmental benefits such as clean air and water and wildlife habitat   ____
c) Social benefits such as recreation and relaxation   ____
d) Maintaining the global ecosystem   ____
e) Economic benefits such as wealth and jobs   ____
f) As a place for a variety of animal and plant life   ____

*(2) Listed below are things sometimes seen as threats to our forests. Please rate how much of a **long-term threat** you think each is by circling the number at the end of the statement that corresponds to the scale (i.e. 1-5 according to the scale).*

		Not a threat at all	Not much of a threat	Somewhat of a threat	A great threat	No Opinion
a.	Forest fires	1	2	3	4	5
b.	The amount of trees being logged	1	2	3	4	5
c.	Climate change or global warming	1	2	3	4	5
d.	Loss of forested land for other purposes such as agriculture or urbanization	1	2	3	4	5

		Not a threat at all	Not much of a threat	Somewhat of a threat	**A great threat**	No Opinion
e.	Logging practices	1	2	3	4	5
f.	Insects and diseases	1	2	3	4	5
g.	The amount of forested land in the province allocated for timber harvesting	1	2	3	4	5
h.	The amount of recreation use occurring in the forest	1	2	3	4	5
i.	Oil and gas exploration and pipelines	1	2	3	4	5
j.	Negative publicity about forest management	1	2	3	4	5

(3) *We are interested in how people **feel about forests** – please indicate how you feel about each statement by circling the number according to the scale.*

		Totally disagree	Partly disagree	Neither agree nor disagree	Partly agree	**Totally agree**	Not sure
a)	Whether or not I get to visit the forest as much as I like, it is important for me to know that forests exist in NW Saskatchewan	1	2	3	4	5	6
b)	Forests should be managed to meet as many human needs as possible	1	2	3	4	5	6
c)	Forests should have the right to exist for their own sake, regardless of human concerns and uses	1	2	3	4	5	6
d)	Forests are sacred places and give us a sense of peace and well-being	1	2	3	4	5	6
e)	Forests should exist mainly to serve human needs, if not then it is a waste of our natural resources	1	2	3	4	5	6
f)	It is important to maintain the forests for future generations	1	2	3	4	5	6

|	Totally disagree	Partly disagree	Neither agree nor disagree	Partly agree	Totally agree	Not sure
g) Forests should be left to grow, develop, and succumb to natural forces without being managed by humans	1	2	3	4	5	6
h) Humans should have more respect and admiration for the forests	1	2	3	4	5	6
i) Forests let us feel close to nature and rejuvenate the human spirit	1	2	3	4	5	6
j) If forests are not threatened by human actions, we should use them to add to the quality of human life	1	2	3	4	5	6
k) Forests can be improved through management by humans	1	2	3	4	5	6
l) Wildlife, plants, and humans should have equal rights to live and develop	1	2	3	4	5	6
m) The primary function of forests should be for the products and services that are useful to humans	1	2	3	4	5	6

(4) *The following asks **your opinion about forest management** in Saskatchewan. Please indicate how you feel according to the same scale used above.*

	Totally disagree	Partly disagree	Neither agree nor disagree	Partly agree	Totally agree	Not sure
a) Forest are being managed for a wide range of uses and values, not just timber	1	2	3	4	5	6
b) Forest management does a good job at including environmental concerns	1	2	3	4	5	6
c) There will be sufficient wood in Saskatchewan to meet our future needs	1	2	3	4	5	6
d) Saskatchewan has enough protected areas such as provincial and national parks or wilderness areas	1	2	3	4	5	6
e) When making forest decisions, the concerns of communities close to the forest should be given higher priority than other distant communities	1	2	3	4	5	6

		Totally disagree	Partly disagree	Neither agree nor disagree	Partly agree	Totally agree	Not sure
f)	Forest management should try to create more jobs through (you may circle the preferred method(s) if stated here) commercial recreation and tourism, harvesting plant and animal products, mining, etc	1	2	3	4	5	6
g)	The present rate of logging is too great to sustain our forests in the future	1	2	3	4	5	6
h)	Forests are being managed successfully for the benefit of future generations	1	2	3	4	5	6
i)	The forest industry controls too much of Saskatchewan's forests	1	2	3	4	5	6
j)	Communities that depend on the forest for their economic well-being are given adequate consideration in forest management	1	2	3	4	5	6
k)	Enough harvested trees are being replaced by planting new ones or by natural seeding to meet our future needs	1	2	3	4	5	6
l)	The economic benefits from forestry usually outweigh any negative consequences	1	2	3	4	5	6
m)	Economic stability of communities is more important than setting aside forests from logging	1	2	3	4	5	6
n)	Forestry practices generally produce few long-term negative effects on the environment	1	2	3	4	5	6
o)	The citizens of Saskatchewan have enough say in forest management	1	2	3	4	5	6
p)	Forest management should try to minimize impacts on traditional rural ways of life (e.g. hunting and fishing for food)	1	2	3	4	5	6

Section II
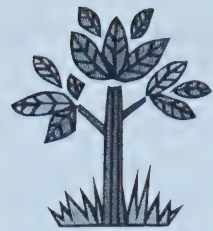
Information about you – These questions will help determine if there are connections between peoples backgrounds and their opinions. Your name will not be associated with the answers however if there is a question you feel uncomfortable answering, just leave it blank and proceed to the next question.

9. Gender Male ____ Female ____

10. Age ____ years

11. Do you belong to the one of the following organizations?
   - a. Natural history or birdwatching club   Yes ____ No ____
   - b. Hunting or fishing organization   Yes ____ No ____
   - c. Other environmental or conservation organizations   Yes ____ No ____

12. Does anyone in your household depend upon the forest, mining, oil and gas industries, or a natural resource agency for their economic livelihood?   Yes ____ No ____

13. What is the highest level of education that you have completed?

   ____ Never attended school   ____ Some University
   ____ Grade school (grades 1 to 9)   ____ University degree (Bachelors)
   ____ Some high School   ____ Some Graduate studies
   ____ High school graduate   ____ Graduate University Degree
   ____ Technical school or community college

14. Which Category best describes your **total household income** (before taxes) in 1999?

   ____ less than $ 10,000   ____ $ 30 – $ 39,999   ____ $ 60 – $ 69,999   ____ $90 – $ 99,999
   ____ $ 10 – $ 19,999   ____ $ 40 – $ 49,999   ____ $ 70 – $79,999   ____ $100,000 or more
   ____ $ 20 – $ 29,999   ____ $ 50 – $ 59,999   ____ $80 – $ 89,999

15. Do you participate in any of the following activities in Northwest (NW) Saskatchewan?

		Yes	No
a.	Camping	___	___
b.	Hiking/walking	___	___
c.	Bird watching	___	___
d.	Viewing other wildlife	___	___
e.	Backpacking	___	___
f.	Snowmobiling	___	___
g.	Quadding, ATVing, dirt biking	___	___
h.	Horseback riding	___	___
i.	Mountain biking	___	___
j.	Cross country skiing	___	___
k.	Canoeing, rafting, or boating	___	___
l.	Hunting	___	___
m.	Fishing	___	___
n.	Other(s): _____	___	___

Part II   Saskatchewan Forests - Considering the Options

In the following exercise, we would like your opinions about forest resource scenarios. In each case, we would like you to compare the current state of the forest against two possible future scenarios. You will be presented with sixteen sets of future scenarios that examine forestry and wildlife issues in northwestern Saskatchewan (the forest near Meadow Lake, and surrounding area, given the name "NorSask forest").

Each set of options will be described by attributes such as moose population level; special species; forest age class by percent old; recreation restrictions and forest access; protected areas; direct and indirect employment in the forestry industry; and finally, changes in provincial income taxes per household. Imagine that these scenarios for northwestern Saskatchewan represent the future state of the region and its forest resources. In each set of three choices, **please treat each set as one choice to be made, unrelated to all previous and future sets. In each case, choose the one option you like the best (or dislike the least) based on your opinion.**

NOTE: We have enclosed a description of the attributes to explain the future scenarios. Please take a few minutes to read the descriptions before completing this section. Take the pullout section of this package to use as a quick reference for the attribute 'levels' when completing the survey. An example follows the description of the attributes and will show how to complete each choice task.

Forestry in the Boreal Forest

The Boreal forest and the role of natural disturbances

The boreal forest, one of the largest forest ecosystems in the world, has evolved with **fire** as the **main disturbance** or force of change and regeneration throughout history. The influence of fire, and to a lesser degree, insects, disease, and wind damage, have changed small and large areas of the forest frequently throughout the past, which has made the **boreal forest very "dynamic" or constantly changing**. This dynamic nature is important to realize because the forest *will not* remain in the same state over time no matter what humans do. Natural disturbance has played a vital role in the boreal forests natural lifecycle and renewal process. Human activities (such as forestry, agriculture, and oil & gas exploration) now affect the landscape on a scale similar to these large natural processes. Therefore it is essential to consider the future possibilities and how the human decisions and actions may contribute to the shaping of the landscape over time. *The exercise below tries to understand the human preferences in this process.*

Forest Management Agreement

A Forest Management Agreement (FMA) is a contract between the government and a private corporation (forestry companies) to grow, harvest, and establish timber on a sustained yield basis, typically for 20 years

Trade-offs involved in making choices

The choices in the survey are designed so that the different attributes or characteristics of the forest are represented in a realistic manner. By this we mean that **not all the valuable features of a forest can be enjoyed without limit**. We make choices based on priorities or highest value and a "trade off" occurs. For example, if people want more forestry jobs they should understand that less of something else might be the consequence – like less protected areas. This is a more realistic way to make decisions and choose amongst a whole set of options or activities. *Therefore, understanding that trade-offs occur, and being more aware of them, is important when making decisions.*

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Description of Attributes

The NorSask forest has many different attributes (inherent characteristic or quality used to identify something). Of these many attributes, only seven are discussed below. Some attributes have been identified, through public consultation, as the most important attributes desired in the present and future forest. Other attributes, such as household income taxes and employment are included to reflect the reality of regional economics and communities that rely on forest resources. These attributes may be described or conceptualized in many different ways including the descriptions below.

1) Moose Population (ungulates):

→ Ungulates are large hoofed mammals; such as moose, deer, and elk. Moose seek out burned or harvested areas for their favorite food types, which are mostly young aspen, birch, and willow twigs (i.e. browse). All of these **plant food sources are dependent on sunlight and therefore grow in open spaces. Fire, clearcutting, and selective harvesting are three different landscape changes but each may increase food sources for the moose**. Additionally, a food source must be close to shelter and calving areas for the moose to thrive in an area.

Moose population information:
Level 1: **2,000**: The number of moose corresponding a low density in NW Saskatchewan.
Level 2: **6,000**: The number of moose corresponding to a low to average density in NW Saskatchewan.
Level 3: **7500**: The number of moose corresponding to an average to high density in NW Saskatchewan
        (current population estimate)
Level 4: **14,000**: The number of moose corresponding to the highest density in NW Saskatchewan.

2) Special Species - for example Caribou

→ Caribou (also ungulates) – are wide-ranging in the boreal forest, **dependent on old growth forests, and are often used as an indicator species for healthy old growth forest and biodiversity (number of different species of plantrs and animals).** The Woodland Caribou is an at-risk or vulnerable species because of **low numbers and sensitivity to human impacts. Population estimates are somewhat uncertain for northwestern Saskatchewan**.

→ Habitat disturbances, such as the construction of forestry roads and forest activity, may increase the number of moose and thus wolves, which further contribute to the decline in caribou. It is important to understand that caribou and moose population numbers usually move in opposite directions due to opposite foraging and habitat preferences.

→ **Woodland Caribou prefer mature forests**, which contain large quantities of lichen and are associated with marshes, bogs, lakes and rivers. The reproduction rate of Woodland Caribou is low. Caribou herds have been on the decline for a number of reasons including destruction of habitat, intense hunting (illegal and unintentional -- due to misidentification), natural predators such as bears and wolves that attack the young, oil and gas activity (seismic or pipelines), roadkills, and parasites.

Level 1: **50**: The chance of continued survival is low
Level 2: **300 to 500**: The **current population level estimate**
Level 3: **600**: Population level considered necessary to achieve a balance between caribou and their predators

Level 4: **1,600**: Historical population level

3) Forest Age Class - % Old Age Classes ("Old Growth"):

The attribute here is a forest age class mix that tries to deliver the forest shape and structure that allows ecosystem function and habitat required by wildlife.

→ An age-class distribution is the groups into which **the age ranges of trees, forests, stands or forests types** is divided for classification The age class and tree species making up the forest largely determines the forest structure (shape and process). The shapes and sizes of stands can be altered for a variety of purposes such as attractive sceneries or controlling animal and pest populations.

→ **A forest is composed of many different age classes**. In order to harvest timber and supply the other human values for the forest (while maintaining the most biodiversity and other ecosystem services possible such as clean air and water), forest managers are interested in making available the most appropriate range of age classes. **The "correct" or "natural" amount of each age-class is uncertain due to the natural variation in age-class distributions within the boreal forest over time. Hence, public opinion is sought to help determine what is the most appropriate based on both science and the human preference within the recognized randomness or changeability.** The different age classes may be represented by the percentage of the forest that is old (for example greater than 80-100 years). Refer to **Figure 1** at the end of this section to help visualize this classification.

→ An **old forest** may be described as **containing live and dead trees of various sizes, species, composition, and age class**. The snags (dead standing trees) provide cavities and food for many different birds and mammals while the fallen logs are sources of shelter and **future soil**. Many insects and microorganism also rely on decaying wood material. These organisms recycle nutrients and form the basis for all life. **Old age-classes are seldom abundant relative to young and mature forests because they take so long to develop** and therefore are subject to many threats over their lifetime (e.g. fire, disease). Hence, they are often located in areas that have not been (or are not as likely to be) naturally disturbed for long periods of time.

→ **Conifers** (trees that have cones e.g. Spruce) in the boreal forest may be considered old if they are **older than 100 yrs** whereas **deciduous trees** such as **Aspen over 80 years** of age may be considered old. If the amount of old forest becomes too old or too large, it may or may not become even more vulnerable to fire and burn.

Level 1: **Less than Current Amount of OLD Forest**
　　　% "Aspen" greater than 80 yrs → 5%　　　% "Conifers" greater than 100 yrs → 15%
Level 2: **Current Amount of OLD Forest**
　　　% "Aspen" greater than 80 yrs → 9%　　　% "Conifers" greater than 100 yrs → 22%
Level 3: **More than Current Amount of OLD Forest**
　　　% "Aspen" greater than 80 yrs → 12%　　　% "Conifers" greater than 100 yrs → 25 %
Level 4: **Considerably more than Current Amount of OLD Forest**
　　　% "Aspen" greater than 80 yrs → 15%　　　% "Conifers" greater than 100 yrs → 35%
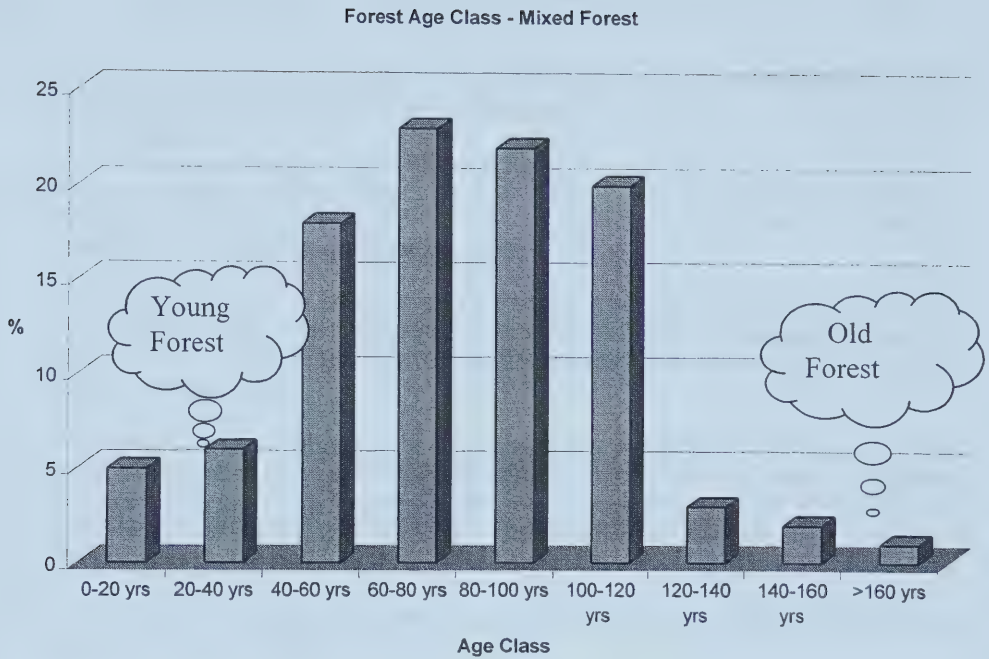
Figure 1: Age-Class illustration

4) Recreation Restrictions and Forest Access:

→ The **number of roads into a forested area affects the biodiversity by changing the habitat, fragmenting (or breaking up the forest), and allowing increasing numbers of people to a site or area (different degrees of human congestion).**

→ Increased access often brings **increased recreational opportunities**. Some possible low impact activities are cross-country skiing, wild berry picking, and hiking and camping. Other forms of activity with greater impacts on wildlife and habitat may include **off-road recreation vehicles** (ATV's and snowmobiles) **and hunting** (subsistence and outfitting) to an area.

→ Forestry roads are initially constructed to facilitate harvest operations, maintain silviculture activities (planting and thinning of trees), and controlling fires.

→ Road density and road design is an issue related to water quality, fish numbers and human access. Stream crossing and a high-density road complex are associated with increased erosion, the silting and degradation of water quality, and fish migration and populations. **The amount of effort is linked to access.** The less effort required arriving at a location the greater the access. Deliberate efforts may be taken to close some roads to protect wildlife.

The amount and intensity of recreational activity may range from unrestricted recreation activities to restricted.

Level 1: **Two-wheel drive (2WD) access** (i.e. any car may drive into area). Hunting and fishing allowed; off-road vehicles, horses, helicopters and overnight camping allowed. **Unrestricted.**

Level 2: **Four-wheel drive (4WD) required to access area** (i.e. trucks with greater clearance); Hunting and fishing allowed; off-road vehicles, horses, and helicopters but **overnight camping allowed only in designated areas.**

Level 3: **All terrain vehicles (ATV) are required to access area** (i.e. challenging quad or snowmobile riding); **Areas developed with restrictions on hunting and fishing** (e.g. limited entry hunting draw, catch and release fishing) horses and overnight camping in designated areas.

Level 4: **Foot access only** (i.e. walking or hiking); **restrictions on hunting and fishing** (e.g. limited entry hunting draw, catch and release fishing) horses and overnight camping in designated areas. **No off-road vehicles, reduced speed limits on highways in the area, no horses, no helicopters, walking and hiking only on designated trails, and limited access to overnight camping** (permits required).

NOTE: There would be **no change to the present rights of Aboriginal Peoples in regards to land use in this representation.**

5) Protected Area:

Protected Areas - areas set aside from present harvesting activity. These may act as benchmarks or reference points for comparative research and education (i.e. long-term monitoring and provide a scientific basis for adjusting land-use planning and processes that support the diversity of species, ecosystems and landscapes found in Saskatchewan) and provide a source or bank of ecological material (i.e. biodiversity).

→ These may come in the form of large buffers along streams and lakes; fur buffers; sacred and spiritual ground buffers and wide buffers around First Nation communities as well as around wildlife corridors (forest connectivity for wildlife to travel across landscapes) and calving/wintering habitat.

→ The NorSask FMA has a Core Area of approximately 1.7 million hectares. Of this area, approximately 46% is currently 'productive forest' (forest that may be harvested under present technology and economic feasibility) and thus approximately 54% of the core area will not be harvested. Additionally, some other parts of the productive forest landbase (estimated to be 2 to 3%) will also not be harvested due to remoteness, biodiversity, heritage, cultural, riparian, and aesthetic values. Therefore, approximately 43 to 44% of the total core landbase area may be subject to harvesting activity in the foreseeable future and the current amount left unharvested is 56 to 57 %.

NOTE: **Currently, Mistik Management maintains some 'protected areas' required by harvest regulations (for example watercourse buffers). Additionally, other buffer zones exist around calving areas, trap lines, sacred sites and First Nations communities as deemed important through co-management boards (process in which local people and resource users share in decision-making).**

The levels below refer to **Protected Area above the current protection** (either by regulations or voluntarily by co-management board suggestions).

Level 1: **Current Amount**
Level 2: **5% Above Current Amount**
Level 3: **10% Above Current Amount**
Level 4: **15% Above Current Amount**

6) Direct and Indirect Forest Industry Employment:

This attribute refers to the **number of direct and indirect jobs in Meadow Lake and surrounding areas (NorSask Forest).**

→ **Direct** forestry jobs may be in: management, sawmill or pulpmill, field contractors that harvest and transport the logs, tree-planters, silviculture, etc.

→ **Indirect** jobs are the jobs that are generated due to the primary industry. In this case the forest sector. These would be businesses that supply the required goods and services to the people employed in forestry.

7) Annual Provincial Household Income Tax changes:

The Provincial Government acquires revenue from forest industry activities through taxes on wood volumes, taxes on labour income, and taxes on profits.

→ **Tax levels may increase because of lower revenues** to the province and money may be required for retraining and relocation of workers: increased costs of management of wilderness areas, intensive management of wildlife species like woodland caribou, and possibly increased costs of management of recreation activities.

→ **Tax levels may also decrease if additional revenues are generated** (from forestry, other industrial activity such as mining or oil and gas development, or recreation and tourism).

*Imagine these choices as **different "futures"**. Some of the attributes are related and some are not. **For each of the scenarios presented, we would like you to select one option**.*

STEP 1: Compare the options offered in each situation.

Example:

Attributes of NorSask Forest	Option 1 ***Current situation***	Option 2 Alternative situation	Option 3 Alternative situation
Moose (ungulates)	7500 moose	2000 moose	14,000 moose
Special Species - Caribou	400 caribou	600 caribou	50 caribou
Forest Age Class (% Old)	Current Amount (% Old)	Considerably more than Current Amount (% Old)	Less than Current Amount (% Old)
Recreation Restrictions & Forest Access	2WD	ATV	2WD
Protected Area (%)	Current Amount	15% Above Current Amount	Current Amount
Forest Industry Employment	600 Jobs	300 Jobs	700 Jobs
Provincial Household Income Tax Change	No Change in household taxes/year	$60 increase in household taxes/year	$40 decrease in household taxes/year

Choose One Only: ☐   ☐   ☑

Suppose in this set I like 'option 3' because it offers what I feel is the best combination - then I would choose 'option 3' by checking the box below that column.

STEP 2: Indicate your choice by checking the

*Note: In all your choices **assume water quality** (Low road density, bridges, winter roads, minimize sediment loads into waterways), **traplines, and understory protection** (such as berries and medicinal plants) **remain constant** and that the best available science and practices will be applied to them.*